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ABSTRACT

Information problems of health science students receiving their education in rural areas were studied by the Bio-Medical Library of Minnesota to: (1) delineate and describe off-campus students' needs for, and access to, information; and (2) propose models for providing information services. Forty students of the Rural Physician Associate Program (RPAP) and 34 hospital libraries in the geographical area responded to questionnaires. Student information requests for Bio-Medical Library searches increased from 1974 to 1977. Patient care problems and faculty visits were primary purposes for requesting information. Disease-related information was most frequently requested, and recent journal publications were frequently used. Based on published standards, half of the libraries did not provide information services for students; journal collections were poor and interlibrary loan services not available. However, five libraries provided all recommended services. Based on evaluation and cost analysis of RPAP library services two information models were proposed: the learning center and library consortium. Further exploration included access to a minicomputer system and computer assisted instruction. The appendices include data analysis, questionnaires, program descriptions, and references. (Author/KP)

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Analysis of Information Needs
of
Off-Campus Health Science Students

A Report Prepared for
Area Health Education Center
University of Minnesota

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

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Document Resume

Under a grant from the University of Minnesota Area Health Education Center, off-campus students' information needs were studied by Bio-Medical Library. The purpose of the study was to (1) deliniate and describe students' need for and access to information, and (2) to purpose models for providing information services.

Students participating in the Rural Physician Associate Program (RPAP) provided the data for analysis of information needs and information-seeking behavior. Hospital libraries at RPAP locations served as a sample for analysis of local resources.

The information needs of students were characterized by purpose, subject, format, publication date, and accessibility of materials. Hospital resources were evaluated to determine availability of journal collections and library services to the students.

Information-seeking behavior was studied as it relates to (1) the resources used by students; (2) the sequence of the student search; and (3) correlation between student use of Bio-Medical Library and hospital library services.

The present RPAP library services was evaluated as a model for providing library services and costs of the service were analyzed. Based on the analysis of RPAP and the students information needs, two information models were purposed: the learning resource center and the library consortium. The models provided a description of services and resources, the associated influences and costs, and relationships with the Resource Library.

Further exploration of the models included a consideration of access to a minicomputer system and the addition of computer-assisted-instruction.

Student information needs are similar to those of health care professionals working in non-urban areas. Development of information resources at the local level serves the student as well as the health care professional.

Section A. Information Needs of Students

I. Introduction

An increasing number of health science students are receiving part of their education in communities separated geographically from the urban college or University. (Appendix 1) These educational programs have as one goal the expansion of the learning experience through contribution to patient care while learning principles of health care in the rural area. Although the students enjoy a unique one-to-one relationship with a practitioner/teacher, they often are isolated from student peers, other faculty members and the resources of an adequate library. They move from an information-rich environment to a non-urban area where the variety of access points to information is limited or unfamiliar to the student. The information problems of the rural health professional[1] become the information problems of the student who elects clinical study in the non-urban setting. As a major resource library in Minnesota, the Bio-Medical Library has been active in providing information to health professionals throughout the state; (Appendix 2) but an evaluation has not been specifically directed toward the off-campus student. A number of questions may be addressed: What information does the student need? How do students seek information? Are local hospital library resources adequate? What is the role of the Bio-Medical Library? What are the costs of library services? What methods can be used to provide information services?

A. Statement of Purpose

Under a grant from the University of Minnesota Area Health Education Center, the off-campus students' information problems were studied by the Bio-Medical Library from May to September, 1977.

The purpose of the study was (1) to delineate and describe off-campus health science students' needs for and access to information, especially as they relate to hospital library resources and to Bio-Medical Library services; (2) to purpose several models for providing information services; and (3) to clarify areas for further information-related exploration.

Definition of Terms

Throughout this study the following definitions apply:

1. Off-campus students: University of Minnesota students studying in non-urban areas of Minnesota, specifically excluding Minneapolis, St. Paul, Duluth and Rochester.
2. Local (or community) library resources: Library resources and services available in the non-urban community where University students are studying.
3. Resource Library. A large library with a comprehensive collection and a variety of services, such as Bio-Medical Library, University of Minnesota, Medical Library, University of Minnesota at Duluth and Mayo Clinic Library at Rochester.
4. Regional Library. A library providing services to both a primary clientele and a specified geographic area within the state.

B. Review of the Literature

Studies of information needs and library services to off-campus students focus on non-traditional programs, such as the Open University, University Without Walls. Literature on these programs has been reviewed by Fletcher,[2] Kreplin,[3] and Sharon.[4] Bradley and Palola[5] survey two Empire regional centers, including their use of public and academic libraries. Based on a questionnaire, Growik[6] analyzed use of library resources by non-residential degree students. Nolan[7] provides an overview of non-traditional degree programs, including Minnesota Metropolitan State College in Minneapolis, Empire State College in New York, the Vermont Community College system and the British Open University. Some arguments against the librarian's role in the external degree program are presented by Morris.[8] Richards and Oakey examine by case study a number of non-traditional programs, including Open University of Pennsylvania, British Open University, Prince George's County Library (Maryland), University Without Walls at Skidmore, Empire State College at Saratoga, Minnesota Metropolitan State College, and Cambridge Public Library.

The literature on non-traditional programs provides useful insights but it does not address the information problems of off-campus health science students in non-urban areas. A review of the literature reveals that little has been written. Traditionally, health science students have received clinical experience through affiliation agreements with outside health care institutions. Selecting a rural site for this experience is a fairly recent phenomena stimulated by the concern over maldistribution of health practitioners.[10] The National League for Nursing has studied the open curriculum for nursing students. Of the NLN sponsored conferences on the open curriculum, the 1974 conference provides an overview of the movement.[11] In establishing educational standards for expanded nurse role eduction, the American Nurses Association lists learning resources (libraries,learning labs, audiovisual labs) as a factor to consider when selecting sites.[12] Redman[13] proposes an external degree program for University of Minnesota students stressing both geographic distribution of students and new teaching methods. Foreman, Wulff and Verby[14] describe an information service for medical students studying in rural areas. Further evaluation of this library program is provided by Foreman and Baldwin.[15] Wender[16] studied subject areas requested by medical students serving a preceptorship in a rural area as part of a more comprehensive research project on clinician continuing education.

C. Samples

The samples consisted of (1) the 40 students participating in the Rural Physician Associate Program (RPAP), University of Minnesota Medical School and (2) the 34 hospital libraries located in the area where students were studying. Students participating in the ten month RPAP work with a preceptor in a non-urban area. As Appendix I reveals, these forty medical students are not a random sample of all Minnesota students studying in non-urban areas. Choice of the sample was pragmatic. The RPAP students were the only off-campus students available as a sample population during the time period of the study. Thus generalizations from this sample to the larger population can not be made without repeating the study or by validating the findings with consistent reports in the literature.[17]

D. Data Collection

Data collection consisted of questionnaires to students participating in RPAP (Appendix 3) and to hospital libraries in areas where RPAP students were located (Appendix 4). In addition, completed student information requests forms and interlibrary loan forms from September, 1976 through April, 1977 were used in the analysis.

Section A.

II. Student Information Needs

A. Introduction and Problem Statement

Curricula in higher education too often separates the student "from an opportunity to test the consequences of his or her learning through work."[1] Traditionally, students postpone application of knowledge;[2] however, students with a clinical educational component must apply previous learning or seek new information in a problem-solving environment. The preceptor or clinical instructor serve both as a role model and as a teacher who provides experience and information. For the student, the clinical period protends an extremely rapid period of development.[3] According to Knowles, a period of rapid development and change constitutes a "teachable moment."[4] At such moments information is most meaningful. Although teacher-student interaction fulfills some information needs, students use other resources as well.[5] Libraries or library services are a major information resource for students. If a library is to respond to student information needs, such needs must be defined.

A primary objective of the present study is to characterize the information needs of clinical off-campus students studying in a non-urban area. It was hypothesized that (1) students do in fact need library-based information to support their learning experience and that (2) information needs can be described by certain characteristics:

1. purpose for the needed information
2. subject content of the information
3. format of the informational material
4. currency of information
5. rapidity of access to information

B. Analysis of Information Needs

1. Requests Received

Rural Physician Associate Program student requests received by the Bio-Medical Library provide some indication that students need a source for information. RPAP student information requests have steadily increased on a per capita basis from the inception of the library service.

TABLE I. PER CAPITA
BIO-MEDICAL LIBRARY LITERATURE SEARCHES

Year	Number of Students	Number of Searches	Per Capita Usage
FY 74-75	38	301	7.92
FY 75-76	40	434	10.85
FY 76-77	40	667	16.68

Although the data shown in TABLE I covers only a three year period, two increases in usage rates are observed. If a change in usage rates had an equal probability to be less as to be more, two increases would occur with only a twenty-five percent chance. Conclusion can not be based on a three year period, but increasing usage may be considered an indication of need.

2. Information Purpose

Students request information for a number of reasons: patient care problems, faculty visits, writing papers, and for future anticipated use. It was hypothesized that the primary purpose for requests to Bio-Medical Library is patient care questions. To test the hypothesis, data was obtained from thirty-one students who responded to the questionnaire.

TABLE II provides a total of student responses. Among the categories marked by a numeral, there are a total of 80 "very often" or "often" answers, 71 "sometimes", and 66 "rarely" or "never" answers. If students were indifferent to the reasons for information all rows would show the same distribution of 219 responses in the major categories, (80/127) x 31 would fall into the "often" or "very often" column in any row. The average number in the "very often" or "often" column would be 11.44; in the "sometimes" column, 10.14; and in "rarely" or "never," 9.42. These average numbers of responses per column can be compared to the actual number of responses by the chi-squared statistic. (see Appendix 5).

The chi-squared statistic assumes that the rows are independent; we are looking at a sample of responses randomly chosen, not seven samples from the same population of people. Thus, if it is assumed that an individual's response to one item does not influence his response to another, the chi-squared can be used. A chi-squared value of 61.684 was calculated, which is significant at the 1% level. If all rows were the same, the odds would be 99 to 1 against such a high chi-squared value. However, the assumption of independent rows does not hold. A student who marks "often" in one row will probably balance his "often" answer with a "sometimes" or "rarely" elsewhere in the table. It is misleading to use the chi-squared statistic as if rows were independent since responses to one row are in part determined by responses in the other rows. A survey participant could not answer "very often" to all categories and remain logically consistent or even credible. He would have to mix his responses.

Even in the face of this dependency, one can control the probability of rejecting the hypothesis that response frequencies fall according to the average. On the basis of the Bonfernni inequality, one can conclude that any chi-squared value as large as 8.14 indicates a difference at the 13% level. When it is said that chi-squared value 8.14 or more means a difference from the average frequencies, the odds are 6.7 to 1 against concluding a difference exists when it in fact does not.

The Bonfernni procedure used to arrive at this statement is conservative since our chance of rejecting a true hypothesis may be lower, much lower, than 13%.

TABLE II

PURPOSE FOR INFORMATION REQUESTS

	Very Often or Often	Some-times	Rarely or Never	Chi-Squared
1. Patient Related	18	10	3	8.140
a. increases knowledge of a diagnosed condition	17	11	2	
b. explore a tentative diagnosis or treatment	14	13	4	
2. Faculty Visits	18	10	3	8.140
3. Teaching Others	11	6	14	1.999
4. Sociological Aspects	1	8	22	26.779
5. Writing Papers	6	10	15	5.394
6. Future Use	10	14	7	2.262
7. Topic of Interest	16	13	2	8.470
TOTAL	80	71	66	61.684

Using chi-squared at the 13% level shows responses to be different than the average for patient-related reasons, faculty visits, sociological aspects, and topics of interest. Out of these, patient-related, faculty visits, and topics of interest are significantly different because they received high number of "very often or often" responses.

Thus student requests to the Bio-Medical Library are related to two major concerns: patient-related questions and University faculty visits. Reading medical topics of interest also rated high as a purpose for submitting requests. It might be argued that all requests from students in the clinical environment are to some extent patient-related. This undoubtedly is true; but it is possible to discern the immediate need that prompts a search for information. Future studies should include an investigation of the purposes prompting students to use local resources. Use of local resources for immediate patient care problems may indicate that the Bio-Medical Library is used as a backup resource.

3. Information Content

"Comprehensive care is a system of person-and-family-centered care... (It) is the kind of compassionate, personalized, birth-to-death attention-preventive, advisory and rehabilitative, as well as diagnostic and therapeutic- that the ideal family physician used to give (and sometimes still gives)... The aim should be to combine the concentrated knowledge and skills of the specialists with the understanding, wisdom, and continuing care of the generalists, to the end that the patient received precisely as little or as much care as he requires."[6] For patient care to be family centered, the physician must be educated in the social and behavioral sciences.[7] In a description of the University of Minnesota's Rural Physician Associate Program, Verby writes "(The student) can study families "in depth, evaluating the individual members and their roles within the family circle."[8]

From the foregoing, it might be assumed that some information requests to the library would be sociological or psychological in content; however, based on the librarians' experience, a previous study,[9] and Wender's evaluation of student subject requests,[10] it was hypothesized that most student information requests to the library are biological (or clinical) in content.

Data Collection

Between October 1, 1976 and April 30, 1977, 545 student literature search requests were received. Of these, 310 requests forms included the vocabulary terms used in formulating the search strategy. Because MeSH (Medical Subject Headings)[11] is used for formulating MEDLINE[12] and because the terms are familiar to health professionals, the MeSH categories were used to describe the subject areas requested by students. Major MeSH categories are as follows:

A. Anatomical Terms
B. Organisms
C. Diseases
D. Chemical and Drugs
E. Analytical, Diagnostic and Therapeutic Technics and Equipment

F. Psychiagry and Psychology
G. Biological Sciences
H. Physical Sciences
I. Anthropology, Education Sociology and Social Problems
J. Technology, Commerce and Industry
K. Humanities
L. Communication, Library Science and Documentation
M. Name Groups of Persons
N. Health Care

MeSH terms used in the 310 subject requests were talleyed in these categories, DISEASES (Category C) was further divided into the following:

C1	Bacterial and fungal diseases
C2	Virus diseases
C3	Parasitic diseases
C4	Neoplasms
C5	Musculoskeletal diseases
C6	Digestive system diseases
C7	Mouth and tooth diseases
C8	Respiratory tract diseases
C9	Otorhinolaryngologic diseases
C10	Nervous system diseases
C11	Eye diseases
C12	Urologic diseases
C13	Gynecologic and obstetrical diseases
C14	Cardiovascular diseases
C15	Hemic and lymphatic diseases
C16	Neonatal diseases and abnormalities
C17	Skin diseases
C18	Nutritional and metabolic diseases
C19	Endocrine diseases
C20	Immunologic diseases
C21	Injury, occupational diseases, poisoning
C22	Animal diseases
C23	Symptoms and general pathology

After assigning subject terms to the categories, the 310 subject requests (57%) were qustioned as an adequate sample. Because librarians had not recorded MeSH terms for 235 searches, were the subjects of these 235 requests in some way different from the 310 with recorded MeSH terms? A twenty percent systematic sample of the 235 search requests was obtained and formulated[13] with MeSH terms. TABLE III presents designation of terms to MeSH categories for both the original 310 searches and the 20% sample. Chi-squared value calculated for TABLE III is 8.6753, which gives no evidence that the sample is any different from the original 310 requests. Thus data obtained from the 310 requests was used for the subject analysis of student requests.

Results

Tabulation of the MeSH Terms used in the formulation of 310 search requests produced the following breakdown by MeSH categories:

TABLE III

Comparison of First and Second Sample Subject Requests for Oct., 1976 through April, 1977

MeSH Category	First Sample		Second Sample	
	No. of Times Used	%	No. of Times Used	%
Disease (C)	422	65.4	86	79.6
Chemical and Drugs (D)	99	15.3	8	7.4
Analytical and Diagnostic (E)	49	7.6	6	5.6
Anatomical Terms (H)	25	3.9	4	3.7
Psychiatry and Psychology (F)	27	4.2	1	0.9
All Others	23	3.6	3	2.8
TOTAL	645		108	

TABLE IV

Subject Requests. Diseases (C)

Category Number	MeSH Category	# Times Used	Rank	%
A	Anatomical Terms	25	5	3.9
B	Organisms	1	9	.1
C	Diseases	422	1	65.4
D	Chemical and Drugs	99	2	15.3
E	Analytic, Diagnostic Therapeutic Technics	49	3	7.6
F	Psychiatry, Psychology	27	4	4.1
G	Biological Sciences	12	6	1.9
H	Physical Sciences	0	0	0
I	Anthropology, Education Sociology and Social Phen.	2	8	.3
J	Technology, Industry	0	0	0
K	Humanities	0	0	0
L	Information Science and Communication	1	9	.2
M	Named Groups of Persons	1	9	.2
N	Health Care	6	7	.9
	Total = 645			100%

With 645 terms assigned, each subject request averaged 2.08 MeSH terms assigned. It should be noted that this does not include subheadings (minor descriptors) often used to futher restrict a subject. It is readily obvious that DISEASES (C) accounted for 65.4% and Chemical and Drugs (D), 15.3%, with 19.3% distributed throughout all the other categories. Based on subject requests to the library, disease-related information is most often sought by students in the clinical environment.

The primacy of disease-related subjects has been verified in other studies. Foreman analyzed student requests for a specified period in fiscal year 1975-1976. She found that 66% of subject terms used were from the DISEASES (C) category.[14] In analysis of preceptee search requests from 1973 to 1975, Wender, et.al. reported 84% of searches included a DISEASES (C) term.[15]

Because the DISEASES category ranked so high, the relative use of each subcategory was determined. TABLE IV ranks the DISEASES (C) subcategories according to the number of times a subcategory term was used for formulating a student request. As shown, 14% of 422 DISEASES (C) terms fit into the subcategory NEOPLASMS (C4); almost 10%, GYNECOLOGY AND OBSTETRICAL DISEASES (C13); 9%, CARDIOVASCULAR DISEASES (C14); and 9% NERVOUS SYSTEM DISEASES (C10).

Table V compares RPAP 1976-1977 DISEASES Subcategory use with 1975-1976 data.

TABLE V

Six Highest DISEASES (C) Subcategories

CAT-EGORY #	1975-76 MeSH Subcategory	%	CAT-EGORY #	1976-77 MeSH Subcategory	%
C13	Gynecologic & Obstet. Dis.	13.1	C4	Neoplasms	14.4
C4	Neoplasms	10.5	C13	Gynecologic & Obstet Dis.	9.9
C6	Digestive System Diseases	8.8	C14	Cardiovascular Diseases	9.4
C10	Nervous System Diseases	8.4	C10	Nervous System Diseases	9.0
C14	Cardiovascular Diseases	7.0	C23	Symptoms & General Path.	8.0
C16	Neonatal Diseases & Abnorm	6.0	C6	Digestive System Diseases	8.0
	N = 296			N = 422	

Thus for the past two years, students have requested disease-related information concerning gynecology and obstetrics, neoplasms, the digestive system, and the cardiovascular system with the highest frequency.

A subject analysis of student information requests is useful for librarians planning and providing services. Collections can be strengthened in those areas of student interests. A change toward more sociological, psychological, and health care delivery subject requests could have considerable impact on Bio-Medical Library collections. But generalized assumptions concerning students' subject interests should not be made based on requests for literature searches. As will be shown later in the report, students obtain information from a number of sources. It is true that students seldom requested published material on sociological or psychological aspects of health care. Perhaps students learn the family-center approach to health care through participation in the preceptors' practice or from preceptor-to-student instruction. A role model can provide a source of information as surely as does printed information.

4. Physician Requests

To explore the student-preceptor information relationship further, preceptor subject requests to Bio-Medical Library during the 10 month period were tabulated. Because only 39 preceptor requests were received, an alternative group of non-metropolitan practicing physicians was identified based on interlibrary loan requests received at Bio-Medical Library.

The possibility that these physicians do not necessarily constitute a group comparable to preceptors in the RPAP is recognized. A unique characteristic of the RPAP physician may well be an interest in the teaching-learning process with the student. Therefore, it was hypothesized that during the preceptee year, students' subject requests are similar in content to those of practicing non-metropolitan physicians.

From October 1, 1976 through April 31, 1977 one-hundred seventy-seven interlibrary loan forms listing a physician as the requester were received from non-metropolitan Minnesota locations. The journal article title was analyzed to determine the major MeSH terms used to describe the content. TABLE VI presents the number of times major MeSH category terms were used.

TABLE VI

ILL Requests Received from
Non-Metropolitan Physicians

Category *	MeSH Subject Heading	# Times Used	Rank	Per Cent
A	Anatomical Terms	5	6	1.9
B	Organisms	2	7	0.8
C	Diseases	157	1	62.5
D	Chemical and Drugs	29	3	11.5
E	Analytical, Diagnostic and Therapeutic Technics	38	2	15.1
F	Psychiatry and Psychology	8	5	3.1
G	Biological Sciences	10	4	3.98
H	Physical Sciences	1	8	0.39
K	Humanities	1	9	0.39
		N = 251		

TABLE VII presents the estimated total of MeSH category terms assigned to student requests based on data from TABLE V and the 251 MeSH categories designated for the physicians requests.

TABLE VII

Comparison of Student and Physician
Use of MeSH Categories

MeSH Category	Students	Physicians	Chi-Squared Value
Diseases (C)	852	157	2.1336
Chemical and Drugs (D)	139	29	0.0054
Analytical and Diagnostic (E)	79	38	14.9390
Anatomical Terms (A)	45	5	1.5736
Psychiatry and Psychology (F)	32	8	0.1429
All Other	38	14	2.6385

Comparison of the two groups result in a chi-squared value large enough (25.9813) to conclude that the two distributions are different. Physicians requested information more often described by MeSH category Analytical, Diagnostic and Therapeutic Technics (E). This difference can be explained to some extent. First, student subject requests often are of a general nature; i.e., review articles frequently were needed. Secondly, physician requests to Interlibrary Loan are for specific journal articles, and article titles also tend to be specific. Although MeSH provides separate categories for indexing and searching purposes, analytical, diagnostic and therapeutic technics are disease-related. Although distribution of student and physician requests leads to rejection of the hypothesis based on use of the MeSH categories, it is apparent that both groups request from the library information with biological content.

Physician's requests described by the DISEASES (C) category reveal an interest similar to that of the student group participating in RPAP during the 1976-1977 school year.

TABLE VIII

Six Highest Diseases (C) Subcategories
Non-Metropolitan Physicians

Category Number	MeSH Subcategory	Rank	%	Students Used Rank	Student %
C13	Gynecologic & Obstet. Dis.	1	14	2	9.9
C14	Cardiovascular Diseases	2	12	3	9.4
C6	Digestive System Diseases	3	11.5	6	8.0
C4	Neoplasms	4	10.2	1	14.4
C23	Symptoms and General Path.	5	9.6	5	8.0
C10	Nervous System Diseases	6	6.4	4	9.0
	N = 157				

That physicians request disease-related and treatment information is well documented.[16] In her study of continuing education needs of clinicians, Wender listed the five highest DISEASES (C) categories for a three year period: NEOPLASMS (16.6%), SYMPTOMS AND GENERAL PATHOLOGY (14.1%), CARDIOVASCULAR DISEASES (12.7%), DIGESTIVE SYSTEM DISEASES (11.6%), and NERVOUS SYSTEM DISEASES (10.7%).[17] Compared with the Minnesota physician and RPAP use, only GYNECOLOGIC AND OBSTETRICAL DISEASES (C13) is missing.

When library materials are requested both students and physicians needed information on disease and its diagnosis and treatment. Furthermore, the six highest disease subcategories were similar but with different ranking of use.

5. Information Format

With their emphasis on patient care and disease-related information, clinical students' requests can usually be answered with journal articles. There is some evidence that medical students during clinical clerkships prefer journals as an information source. A study conducted at Standford University revealed that periodical use reaches a peak during the fourth year.[18] According to Mick, for clinical students "the most reliable sources would tend to be recent journals...and files they build from handouts, notes, and xerox copies of articles."[19]

During the eight month period, the RPAP students received a total of 2331 journal articles, a figure which includes 444 requests for specific journal articles. If journal articles proved inadequate to fill a subject requests, a book or photocopy of chapters from a textbook were provided for the student. As a result,121 book chapters were sent. Thus 95% of the documents provided students were journal articles. When asked to judged the relevancy of material received, all 28 students responding rated the information adequate to excellent.

6. Publication Date

Studies of journal usage in hospital libraries provide ample evidence that newer journals are used more frequently in the clinical environment. In a study of publication dates of information sent to physicians, Wender found that 85% of the articles had been published within the last 5 years.[20] Smith reports 75% of reading room and circulation use was of journals published in the most recent five years, and 95% of all periodicals used was published within the past 15 years.[21]

Librarians selecting journal articles for students in the non-urban clinical environment assumed that the most current information was needed. Because MEDLINE was used as the basic selection tool and because many students requested the "newest" information, journal articles sent to students were, in fact, current. TABLE IX compares the publication date of the 1887 articles selected by the librarian with the 444 articles specifically requested by the student.

TABLE IX

Publication Date of Journal Articles
Selected by Librarians and by Students

Publication Date	Student Selection		Librarian Selection	
	Number	Percent	Number	Percent
1975-1977	105	24%	1188	63%
1972-1974	105	24%	492	26%
1969-1971	75	17%	114	6%
- 1968	159	35%	93	5%
	444		1887	

It is interesting to note that, while 63% of the journal articles selected by the librarian were published within the last 3 years, when the selection was made by the students 35% of the articles were older than nine years. Furthermore, when students were asked to evaluate the date of publication of the material selected by the librarians, twenty-seven of the twenty-eight students responding rated the material excellent or good.

The variation between publication dates of the librarian selection and of the student selection is open for speculation and some possible explanations. First, the librarians usually made the first selection from the MEDLINE bibliography, choosing the most current articles. When the student recieved the MEDLINE bibliography and subsequently returned it with additional references selected, the publication dates were older, especially when MEDLINE backfiles had been used. The online MEDLINE file does include citations for review articles dating back to 1966. Secondly, students used bibliographies listed in the journal articles sent as a source for additional references. Again, such bibliographies often list older publications. Of the 28 students responding to the questionnaire, 43% do not have access to Index Medicus or Abridged Index Medicus. Except for the MEDLINE bibliography, their selection would be made from bibliographies found in textbooks and journal articles, both of which usually cite older publications. Thirdly, some students do have access to Index Medicus (57% of the respondents) and others enjoy the benefits of an adequate hospital library. For these students, Bio-Medical Library is a backup resource, providing access to journal files no longer retained by the hospital library. In a study of the use of the Midwest Regional Medical Library, Gomes found that 41.1% of students requested material older than ten years.[22] The Midwest Regional Medical Library also serves as a backup resource after more local sources have been exhausted. Finally, students may request older information because a particular technic or drug was reported in the older literature but is no longer discussed in recent articles. In such cases, however, the librarian too would search the older literature to find an appropriate publication. The students' use of older literature needs further clarification. Perhaps use of older material is related to expediency in finding references. Or perhaps students need instruction in information retrieval before going to a non-urban area.

7. Delivery Time

Students in clinical clerkship programs are widely dispersed throughout the state. (Appendix 6). Learning, according to West, is most effective when it relates directly with an "immediate and important practical purpose, such as dealing with the sick person at hand."[23] Thus information sent to the student from a resource library should arrive in time to be immediately applicable.

In Minnesota, mailing time from the diverse locations averages two days; therefore, postal delivery time requires four days for both requests to arrive at Bio-Medical Library and the material to be received by the student. How rapidly the library fills a request once it has been received may be designated turn-around time. Turn-around time measures library efficiency not how rapidly the student receives information, but it does give an indication of timing. A random sample of 107 requests received during an eight month period provided the data for TABLE X. Requests received with material selected and mailed on the same day are designated 0 days; materials mailed the following day are designated 1 day, etc.

TABLE X

Turn-Around Time for Subject
Requests to Bio-Medical Library

Number of Days to Fill Request	Number of Requests	Percent
0	24	22.4
1	63	58.8
2	15	14.0
3	5	4.6
4 +	0	0
N = 107		

Eighty-one percent of the information requests are processed in less than twenty-eight hours. Based on their response to a questionnaire, all twenty-eight students indicated that turn-around time was good to excellent. When questioned, students in the 1975-1976 RPAP also considered service rapid. From the student's point of view, turn-around time includes the mailing time also; thus a 5 day lapse from initiating the request to receiving the material appears acceptable.

The question of turn-around time requires further investigation. Student response may be based on expectations and on the recognition that mailing does require a certain amount of time. Consider the fact that during a two month period (June-July 1977), one third of the requests were received via telephone. Consider also that the average length of hospital stay for acute illness is 7 days.[24] In the clinical environment, how applicable is material received in 5 days? Would students exposed to technological changes, such as computer access or facsimile transmission, regard the present turn-around time acceptable? It should be noted that, at the present, library service to off-campus students requires the use of MEDLINE to achieve the present level of turn-around time. From a historical perspective, MEDLINE has enhanced the librarians' ability to provide information by eliminating much of the time-consuming manual searching which, to some extent, impeded service to health practitioners during the Northlands Regional Medical Program (See Appendix 2). Could other technological advances have similar impact?

C. Summary

University students studying in non-urban areas need information resources to support their learning. Their information need can be described by certain characteristics: purpose, content, format, currency, and delivery time.

Patient care was a primary purpose for requesting information; however preparation for a faculty visit was of equal importance. Furthermore, students often were exploring a topic of interest. Information is needed for immediate clinical problems but students also request information to support their educational objectives. By selecting material for the students, the Bio-Medical librarians actively participate in the learning process.

Using MeSH categories, analysis of subject content revealed that disease-related information usually was requested. Journal articles proved to be a convenient and acceptable format in providing the information. Recent publications were used, but students also requested older journal articles.

Students request information both for clinical problems and for study purposes. Further investigation is needed to determine how libraries should support these two purposes. The assumption that most requests from students are related to clinical concerns leads to a set of information characteristics somewhat different than those characteristics related to study. A Resource Library, such as Bio-Medical Library, may be better able to provide educational support for students and continuing education programs. Because of accessibility, the hospital library can respond more quickly to patient-related questions.

Section A.

III. Local Hospital Library Resources

A. Introduction and Problem Statement

The biomedical library network as outlined by the National Library of Medicine mandates the community hospital with the responsibility for providing primary information needs of their constituencies.[1] The Regional Medical Library Program has been influential in the development of hospital libraries.[2] In 1970, the Joint Commission on Accreditation of Hospitals revised its standards to include the development of hospital library services that would meet information needs of health care personnel.[3] In addition to those of the Joint Commission, more specific standards have been proposed.[4-6] All such efforts have had an impact; but as McKloskey points out, articles in the literature often describe the ideal.[7] She writes, "Unfortunately, there are many more hospitals in Minnesota which have inadequate library budgets (or none at all); no staff and no clear vision of what services a hospital library can provide."[8] The function and role of the hospital library has been discussed extensively in the literature.[9] Its importance can not be over emphasized. With the decentralization of education, the emphasis on continuing education, and a growing interest in non-urban life styles, development of community library resources is essential. But when the student leaves the academic environment to study in the non-urban area, are local information resources available?

B. Analysis of Resources

A second objective of the study is to evaluate non-urban community hospital libraries. It was hypothesized that hospital libraries would be inadequate as an information resource, based on library journal collections and indexes, library services, and library personnel. Furthermore, if select number of journal titles and library services were available, backup library services from a resource library would be needed.

To assess the adequacy of the hospital library a standard must be determined for both collections and services offered. Various standards have been proposed based on journal titles, number of subscriptions and variety of services.

1. Journal Collections

A standard list of journals may be considered. The concept of a core list of books and journals has been summarized by Stearns and Ratcliff as follows: "The core-library concept is that all major areas of health-care practice, including the basic sciences, be covered in a minimal number of books and journals that are authoritative, current and appropriate to practice..."[10] In addition to the Stearns and Ratcliff core library, a number of lists have been prepared.[11-20] Some of the Regional Medical Programs developed special core lists, such as the Iowa Core Library or Minnesota's The Emergency Care Library and Intensive Coronary Care Unit Shelf List. Many of the core lists are dated; but the Brandon list, which has been consistantly revised since 1965, is most current.[21]

The Brandon list is an excellent standard, being both current and comprehensive. Brandon, however, stresses that the list is "intended to serve as an acquisition aid and is not set forth as the one and only definitive collection for the small medical library."[22] To achieve some variability of the standard, a master core list was compiled based on the Brandon list, the Abridged Index Medicus (AIM) list of 100 titles,[23] and the Kamenoff list of requested journal titles.[24] Journals from Kamenoff's data were included because they are based on actual use in a community hospital. Correlation between AIM and Kamenoff's list is low: 33.3% of Kamenoff's titles are not included in AIM. Compilation of the lists resulted in sixty titles found on all three. (Appendix 7)

It is readily apparent that the master list of journals is too comprehensive for the 28 hospital libraries surveyed. As TABLE XI reveals, one-half of the libraries subscribed to less than 5% of these journals.

TABLE XI

Number of Libraries Subscribing to
Various Percentages of the Master List

Percentage Interval	Number of RPAP Hospitals
75-100	0
50-74	1
25-49	6
5-24	7
less than 5	14

Subject requests from students were most often answered with journal articles. Based on student use, a local core list was defined comprising every journal titles used more than ten times. (Appendix 7) Articles from these forty-seven journals filled one-half of the student requests at an average rate of 20 articles per journal in a nine month period. As shown in TABLE XII, 35.7% subscribed to less than 5% of the local list.

TABLE XII

Number of Libraries Who Subscribe to
Certain Percentages of the Local List

Percentage Interval	Number
75-100	0
50-74	1
25-49	6
5-24	11
less than 5	10

Rather than using a list of specific journal titles as a standard, a hospital library could be evaluated by total number of subscriptions.[25] Using standards proposed by the Arkansas University Medical Center Library[25] and the Connecticut Regional Medical Program[26] results as depicted in TABLE XIII were obtained.

TABLE XIII

Recommended Number of Subscriptions Compared to Hospital Libraries' Collections

Hospital Size	Recommended Minimum No. of Subscriptions	No. of RPAP Hospital Libraries Meeting Standard	No. of RPAP Libraries not Meeting Standard
0 - 50	10	5	5
50 - 100	20	3	3
100 - 200	40	4	6
200 - 400	60	0	2

If total number of subcriptions is used as a standard, 57% of the hospital libraries surveyed are below standard.

The above statements support the contention that, based on journal holdings, the local hospital libraries are not adequate to support information needs of students. Undoubtedly, the libraries need further development; however a standard, as such, may not be applicable unless it is written to match the local situation. Possibly core lists and total number of subscriptions are poor measures of local hospital resources. Swinsow criticizes the core list concept because it encourages uniformity and does not provide a broad range of journals from which to make selections.[27] The following method for determination of the journal collection is proposed wherein the library sets its own standard based on need.

Using patient medical records for a year, a sample of patient diagnoses is obtained. The diagnoses are grouped according to the classification used in the Journal Authority File[28] available through MEDLINE. Accessing the Journal Authority File online, all the journal titles listed under a classification heading can be printed. The citation for each of these journal titles contains various bits of information including a journal code designation. After logging into MEDLINE, the journal code number may be entered and a posting of the number of references available from that particular journal (two-three year period) obtained. The searcher repeats this process for each of the titles. After completing the process, the journals yielding the largest number of articles can be determined.

For example, assume that analysis of the medical records shows a high percentage of obstetrical and gynecological patients. The hospital library should provide a journal for this discipline. Quality of the journal is primary; but consideration also should be given to coverage. Logging into the Journal Authority File and entering Obstetrics and Gynecology gives a posting of 87, i.e., there are 87 journals indexed in MEDLINE classified as Obstetrics and Gynecology. Restricting the search to English only results in 38 postings. As the entry below indicates, the journal code (JC) for the American Journal of Obstetrics and Gynecology is 3NI

```
JT  - AMERICAN JOURNAL of OBSTETRICS and GYNECOLOGY (St. Louis)
TA  - Am J Obstet Gynecol
PL  - United States
LA  - Eng
IS  - 0002-9378
ST  - 1
JD  - Obstetrics and Gynecology
PN  - Z1.107.567.875
ED  - 760320
ES  - 630531
JC  - 3NI
SB  - A
SB  - M
```

After obtaining the journal code for all 38 entries, the searcher logs into MEDLINE. Entering 3NI (JC) the posting result is given as 1742. Thus from 1975 to the present there are 1742 articles indexed in Index Medicus from the American Journal of Obstetrics and Gynecology. Repeating this process with the other journal codes provides information on how many articles are indexed in Index Medicus for each particular journal title. For example Obstetrics and Gynecology (OC2) has 1131 postings, Surgery, Gynecology and Obstetrics (VBD) has 952 postings, and Clinical Obstetrics and Gynecology (DFL) has 470 postings. If the library has Index Medicus, the American Journal of Obstetrics and Gynecology appears to be a logical choice, based only on number of articles. Again, quality of the journal and preference of the physician must be stressed. But this method does allow the hospital librarian to present a wide variety of choices based on the local needs.

2. Library Services

The Joint Commission on the Accreditation of Hospitals (1971)[29] states that library services shall be made available formedical and hospital staff. "Services" has been interpreted to mean the following:

1. a librarian or library manager
2. a reference service including the ability to suggest references, i.e., literature searches
3. document delivery, interlibrary loan and photocopy
4. appropriate indexes, including Index Medicus and access to MEDLINE
5. audio-visual capability

For the purpose of evaluating the hospital libraries in the study, the following nine categories have been used:

1. librarian or library manager
2. reference section
3. literature search capability
4. photocopy service
5. MEDLINE
6. audio-visual capability
7. Index Medicus
8. other indexes
9. interlibrary loan service

Summary data provided in TABLE XIV classify the 28 libraries by the number of services they provide.

TABLE XIV

Services Provided by Twenty-Eight Hospital Libraries

Number of Services Available	Number of Libraries
9	5
8	3
7	4
6	1
5	1
4	2
3	3
2	2
1	3
0	4

Only 13% of the libraries make available all nine services and one-half offer fewer than six services. (See Appendix 9)

Some library services are more essential than others. Furthermore, it may be unreasonable to expect very small hospital libraries to provide the full range of services. Certain services are mandatory if the hospital library is to participate in the Medical Library Network. These would include maintenance of a book and journal collection, Index Medicus, interlibrary loan, and the services of a hospital librarian or library manager. TABLE XV provides data on the services available.

TABLE XV

Services Provided by Hospital Libraries

Services	# of Libraries	Percent
Have a library	23	82
Have a librarian	15	53
Provide Reference	15	53
Provide Literature Searching	13	46
Provide Photocopy	15	53
Provide Access to MEDLINE	12	42
Provide Interlibrary Loan	14	50
Have Audiovisuals	8	28.6
Have Index Medicus	16	57
Have Hospital Lit. Index	6	21
Have Cumulative Index to Nursing Literature	6	21
N = 28		

Thus only one-half of the libraries provide interlibrary loan whereby students could obtain materials not owned by the hospital library. And five hospitals do not have a library or collection of materials.

To gain a better understanding of the library adequacy, a rating can be assigned to each of the services. Each service was allocated five points except "Has a library, including books and journals" which was assigned 10 points. The following arbitrary scale was used:

Good	45 - 55 points
Fair	30 - 40 points
Marginal	15 - 25 points
None or insignificant	0 - 10 points

Based on this scale, the hospital libraries showed the following results:

TABLE XVI

Hospital Library Rating

Rating	Number of Libraries	Percent
Good	8	28.6
Fair	7	25
Marginal	6	21.4
None or insignificant	7	25

C. Summary

Based on published standards, approximately one-half of the libraries surveyed are not prepared to provide information services for students. Too often journal collections are poor and interlibrary loan services are not available. Students need current journals for patient-related problems and backup service for older materials. On the other hand, five hospital libraries provide all the recommended services. Eighty-two percent do provide a library and fifty-three percent have a library manager.

Consider the size of the hospitals in the survey: 2 are under 25 beds; 7 have 25 to 49 beds; 7, 50-99 beds; 10, 100-199 beds; and only 2 have 200-400 beds. It would be difficult for some of these hospitals to support a hospital library meeting the standards. But if students are to be placed in these areas or if continuing education is to be supported, resources must be available from a local or regional or central resource.

Section A.

IV. Information-Seeking

A. Introduction

Education is a search
and not a state of being.[1]

In planning information services for students in non-urban areas, information needs or resource availability are crucial elements; but consideration also must be given to information seeking behavior of the student. In studying information seeking behavior Rubenstein developed a concept of "information style" which he defined as tendency to behave in certain patterns in relation to information seeking and use." "These patterns," he writes, "seem to be relatively stable over long periods of time, but are definitely affected by changes in the environment."[2] The student selecting a rural community for clinical study experiences a change in environment as he moves from the information-rich University community. Not all non-urban communities provide information resources or services to support educational programs. How the student seeks information in the new environment will influence the planning of information services. Either the information resources must fit the student habits or the student must learn new behavior to match the reality.

Literature Review

Authors have addressed the subject of information-seeking by a number of approaches. The diffusion of information has been studied extensively;[3-7] but diffusion research is directed toward a special flow of information rather than toward individual search behavior. Flow of information has been researched[8-11] and information channels have been considered.[12-14] All user behavior studies are of related interest when considering information-seeking behavior; but the literature on user studies is voluminous. State-of-the-art reviews often appear in the Annual Review of Information Science and Technology.[15] Others have directed their research to specific aspects in their exploration of information-seeking. Kernan and Mojena researched the relationship of personality type to information search style.[16] Using a questionnaire survey to academic economists, White deliniates search behavior at specified phases in the research process.[17] The "Invisible College" concept has been studied thoroughly;[18-19] but, again the concept presents a specific informal information pattern.[20-24] Although a number of authors discuss information-seeking behavior, Mick's doctorial dissertation[25] presents a detailed examination. He examines information styles in medicine by identifying groups of medical practitioners displaying similar styles, and he studies the development of these styles.

B. Problem Statement

The Medical Library Network, as planned by the National Library of Medicine, gives the local hospital library the responsibility of providing primary information to health professionals in the community. Considerable planning and effort has gone into the development of these Basic Units. In the decentralized network, Resource Libraries, such as the University Library, are considered a backup resource. For a Resource Library to provide direct library services to the student in the non-urban area raises the question: Is it incongruous to bypass the local hospital library by providing direct library services to the student and, at the same time, to be encouraging local library development and participating in the planning of a network including these local libraries as a primary unit? Resolving that dilemma is beyond the scope of this study. Rather several aspects of the students' information seeking behavior were studied to determine if in fact the problem of incongruency existed:

1. When local library resources are adequate, do students use the Resources Library's service less frequently?

2. When seeking information, do students usually first choose a local resource?

3. During the preceptee year, do students use the same information channels as do practicing physicians?

4. When seeking information, do students usually find the information from a local resource?

Data Collection

Data was collected from the student questionnaire froms, hospital library questionnaire forms, search request forms received at Bio-Medical Library, and a published report of information channels used by Minnesota physicians.

C. Analysis of Information Seeking

1. Resources

Research on information seeking reveals accessibility of a resource is a major reason for its selection.[26] Rosenberg found a high correlation between preferences of an information source and the rated ease of use, while there was no significant correlation between preference and expected amount of information. He concludes that the "ease of use... is more important than the amount of information expected..."[27]

From the survey of hospital libraries only 28.6% were rated as good, that is they provided services mandated by hospital accreditation standards. But students did use the hospital library. Of the 31 students responding, 68% reported using the hospital library often or very often. Bio-Medical Library, with its comprehensive collections of material, is less accessible even with the special library program offered. Only 51.5% claimed frequent use of Bio-Medical Library. Students reported significantly more use of personal resources. Ninety-seven percent stated that their own books and textbooks were the most often used resource.

Although 26.4% of the hospital libraries were rated marginal or below, students did explore the resource provided. Both students and a representative from the hospital library were asked in the questionnaire to indicate services available. Twenty-six matched records shows that students, for the most part, were accurate in their assessment of the hospital library. All students correctly identified the availability of journals, audiovisuals and indexes. But six students were unaware of the interlibrary loan services and five students did not know that a library manager was available to help them. According to the survey, the library managers spend from one hour to thirty hours per week in the library. The student's information-seeking led to the hospital library, but not to the person designated to provide services. Time allocated to some library managers probably does not permit an active program to alert potenital users to services available. Prior to their assignment in a rural area, students need instruction in information retrieval and use of the library.

2. Search Sequence

Students were asked to rank the sources of information according to the sequence of their search. An overall ranking of the sum of ranks yields the following order:

1. personal books, texts, notes
2. preceptor
3. local hospital library
4. Bio-Medical Library
5. other health professionals

Ranks obtained from the survey question are shown in TABLE XVII.

TABLE XVII

Students' Ranking of Sources
According to Order of Searching

Resource	Ranked 1st	Ranked 2nd	Ranked 3rd	Ranked 4th	Ranked 5th
Own books, etc.	26	5	0	0	0
Preceptor	4	15	9	3	0
Local Hospital Lib.	2	10	6	5	4
Bio-Medical Library	0	2	10	13	4
Other Health Professionals	0	0	7	6	14

Kendall's coefficient of concordance shows agreement among the students. At a concordance value of 0.630 the odds would occur less than once in 100 samples from population in which no agreement exists.

3. Bio-Medical Library Use

Whether the local resource is fully adequate or not, students prefer and use the local resource first. Based on the student search habits, it is logical to plan and expand hospital library resources. Further, it is assumed that use of the Bio-Medical Library can be that of backup service for the hospital library. The survey of hospital libraries revealed a wide range of development. It was hypothesized that when hospital libraries were adequate, students would use the special Bio-Medical Library services less frequently. If this is there should be a negative correlation between the library development (the number of services) and the number of requests to Bio-Medical Library. The frequencies for request per student were ranked for Kendall's rank correlation coefficient. (TABLE XVIII).

TABLE XVIII

Relationship between Library Services Available and the Number of Student Requests

Library Services Available	Students	Bio-Med Requests	Bio-Med Request per Person	Rank of Request
9	4	51	12.75	4
8	2	62	31.00	9
7	1	5	5.00	0
6	5	74	14.80	5
5	1	18	18.00	6
4	3	23	7.67	2
3	1	19	19.00	7
2	2	42	21.00	8
1	2	14	7.00	1
0	3	25	8.33	3

The rank correlation obtained is exactly zero; students do not request more articles when the local library has fewer services. It must be concluded that other variables account for the students use of Bio-Medical Library. This relationship warrants further investigation.

4. Physician Information Sources

Physician information-seeking behavior has been reported in the literature. In a study of Minnesota physicians, Fah reported that 96% rated journals as important, followed closely by consultation with physicians (95.2%). Furthermore, 90.8% rated informal conversation with other physicians as an important information source. Students in the non-urban area show a similar rating of sources. Ninety-seven percent of the students rated books and journals as important while 92.5% considered the preceptor as an important source of information. Although printed material ranks high, both groups look to interpersonal sources for information.

In his study of information seeking style in medicine, Mick found that students in clinical areas made most use of both personal resources, such as their own books and journals, and of extrapersonal resources, such as libraries. Practitioners, however, were positive to extrapersonal resources (libraries) and interpersonal resources (communication and consultation with physicians).29 Because practitioners do rate interpersonal resources highly, students need to learn this means of finding information. He suggests the use of an "active preceptor system which provides each student with a faculty preceptor to whom he can turn for information and advice." 30

The RPAP students appear to be benefiting from just such a student-preceptor relationship. After checking their personal resources, they ask their preceptor. Information seeking behavior of physicians who elect to serve as preceptors warrants investigation.

D. Summary

Students frequently do obtain information from a local resource, including their personal books, the preceptor, and the hospital library. They go first to the most accessible sources before seeking information from Bio-Medical Library. They learn to benefit from interpersonal channels of information during their student years.

No correlation was found between the quality of the hospital library and the student's use of Bio-Medical Library Services. Other variables in this relationship must be determined and studied. The preceptor's information-seeking habits need investigation, especially as they relate to the student's information-seeking behavior.

V. Conclusion

Students comprising the sample are a select group - medical students in a special medical program with a library service planned for them. Generalization can not be made for nursing, pharmacy, dentistry and administrative students. Certainly their subject needs would be different and these differences would have considerable impact on both the hospital and the Bio-Medical Library. But they would have information needs and their own information-seeking behaviors. Some students, such as the pharmacy student at a retail location or the public health nurse, may not have close connections with a hospital library. Most hospital libraries do not buy dental literature. Planning is essential. The study does show that, when students leave the University community, they have information needs and that local resources are not always adequate. Planners of independent study, the open curriculum, and other non-traditional programs should consider the present development of local information resources. And there are implications for continuing education programs as well. As programs increase, consideration must be given to local information resources,. Development of regional centers with access to a Resource Library may provide an answer to the question of accessibility.

Section A.

VI. The Rural Physician Associate Program

A. Library Service Description

Bio-Medical Library's information service to students participating in the Rural Physician Associate Program (RPAP) may be viewed as one model for providing library services for students studying in non-urban areas.

The Rural Physician Associate Program places interested medical students in rural communities studying and working under the guidance of a practicing physician. During the nine to twelve month period, students assume responsibility for patient care, while evaluating the role of individuals within the family circle and community. The RPAP has been described in the literature.[1-4]

In the fall of 1974, the Bio-Medical Library and the RPAP initiated a program to provide library services to the RPAP students and their preceptors. Objectives of the information service were (1) to provide information needed by students for patient care, study, research and decision-making; and (2) to acquaint students with a method for obtaining information which would be applicable to rural medical practice. Library services provided include MEDLINE literature searches, photocopy of journal articles, and loan of books and audiovisual materials. The library component of the RPAP has been described in the literature.[5-6]

B. Evaluation

Assumptions that the library program provided a needed service were supported by feedback received from students answering a questionnaire at the close of the 1975-1976 school year. Purpose of the questionnaire was to elicit constructive criticism and comments upon which changes and improvements could be based. As a result, some changes were made; but, on the whole, student evaluation of the library service was positive.[7] To better understand subject areas of student information needs, an analysis of MEDLINE requests was done.[8]

Student use of the Bio-Medical Library Service has been increasing during the past three years.

TABLE XIX
RPAP Use of Bio-Medical Library

Year	No. of Searches	Index of Growth	Pages of Photocopy	Index of Growth
1974-75	301	1.55%	9985	1.76%
1975-76	468	1.53%	17,657	1.77%
1976-77	720	2.21%	31,336	3.13%

As suggested by TABLE XIX, the number of photocopy pages is increasing more rapidly than are requests for literature searches. Bio-Medical librarians have not changed their policy of selecting approximately 3-4 articles per literature search. The increase in photocopy is the result of more student requests for specific articles. Students are using the MEDLINE bibliography to supplement articles selected by the librarian.

Depicted graphically monthly totals of literature search requests reveal that January through April is the heavy use period of Bio-Medical Library services. (see next page).

Students participating in RPAP during the 1976-1977 school year were asked to evaluate the services provided by Bio-Medical Library. Of the 31 students who returned the questionnaire, 28 students had used Bio-Medical Library services; thus returns represent 70% of the RPAP students.

Students were asked to evaluate (1) the amount of material, (2) the relevance of materials, (3) the currency of material, (4) the MEDLINE bibliography, and (5) the turn-around time for receiving material. Of the students responding 85.7% considered the amount of material received good to excellent; four students reported the amount adequate. After seraching the MEDLINE file, Bio-Medical librarians evaluate the journal articles retrieved and select those judged most relevant. Twenty-nine percent of the students considered the articles selected excellent; fifty-four percent rated selection as good, and eighteen percent called the articles adequate for their information need. All but one of the students responded that currency of material was excellent or good.

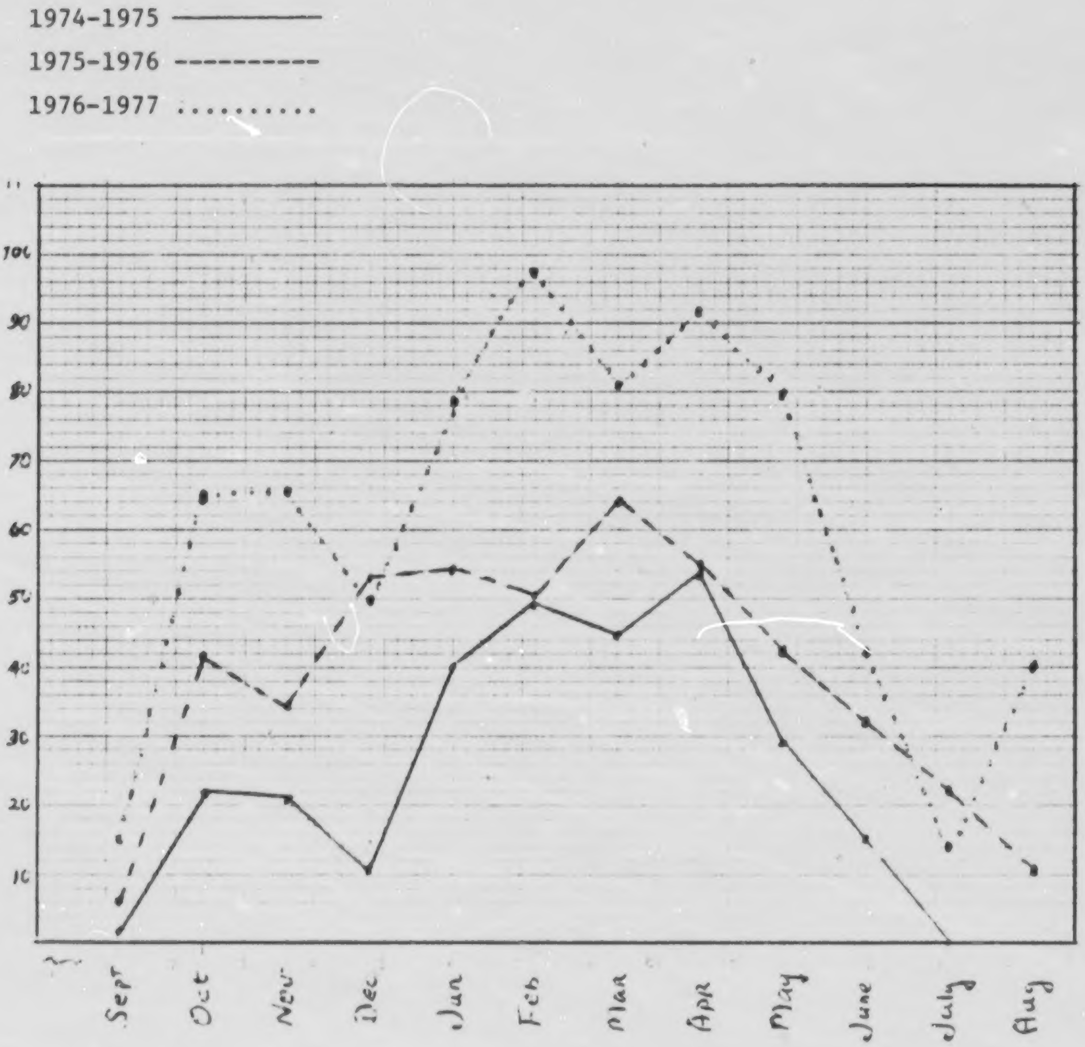
Prior to the RPAP experience, students rarely used MEDLINE. During orientation day, the librarian provided a brief descritpion of MEDLINE; nevertheless, for most students MEDLINE represents a new information retrieval method. Of the students responding, 54% rated MEDLINE excellent; 25% considered MEDLINE good; 14% adequate; and one student rated it unsatisfactory. Because mailing time varies, librarians were concerned that students would not receive material in time to be useful for the immediate need. All the student rated turn-around good or excellent. Finally, students were asked to rate the attitude of the Bio-Medical Library staff members with whom they had contact. All students gave the Bio-Medical staff an excellent (86%) or a good (14%) rating.

Although students had received a fairly long questionnaire eighteen students wrote comments on this portion of the form. A number of these comments were thank you notes, commenting on the rapidity of the service, the timely articles, and the accomodating staff. One student suggested that Bio-Medical librarians teach students more about MEDLINE. Another student wrote, "I wish I could research topics this way all the time and not just on RPAP." After commenting on value of the service, the student explained that he was now developing a file of journal articles to supplement his textbooks. The library service was a "very useful learning tool" according to another student. One commented on the excellent relevancy of the articles, especially considering the "vagueness of the requests."

TABLE XX

RPAP

Monthly Literature Search Requests



Several students offered criticisms of the service. A student who had rated MEDLINE unsatisfactory wrote, "the bibliography is so long and detailed I never took time to use it." One student needed more review articles and another said material was not sufficiently relevant when requests were very specific.

RPAP students provide the medical school with a written report of their clinical experience. Dr. Joseph Connolly provided the following excerpt from a student evaluation:

> An aspect of the RPAP which I personally considered of utmost importance is the necessity of reading. Tabulation of my reading log revealed an average of 85 minutes daily based on my four and one-half day work week. This included only textbooks. An estimated seven to eight hours per week was spent on journals including JAMA, Surgery, Mayo Clinic Procedings, Annals of Surgery, Annals of Internal Medicine, Archives of Surgery, Cancer, Surgery of Gynecology and Obstetrics, and NEJM... Several times interesting cases prompted phone calls to our friend... at the Bio-Medical Library for a search of the literature. This service was used approximately twelve to fifteen times over the year and proved to be extremely valuable. Even though most major textbooks were at our disposal, there still exists a big need for recovery of materials from periodical literature. The quick service we received, usually 24 to 48 hours, prompted both myself and my preceptors to use the system freely. The people at Diehl Hall were always very helpful and cheerful. Their suggestions as to the best most expedient manner for conducting a search almost always provided the utmost in results. My hat is off to (the Bio-Medical Library).

The unsolicited comments of this student provided a summary of the library service to the RPAP. It supports the results of the questionnaire. Students need and use information resources and Bio-Medical Library has been successful in providing at least some of the information sought by these students.

C. Cost Analysis

1. Description of Search Process

Although Bio-Medical Library has been successful in providing information for students, the costs must be considered in evaluating the service. For a cost analysis, a more complete description of the information retrieval process is needed.

The primary services provided for the RPAP student are literature searching and the selection of appropriate material. Students may either mail or telephone a request to the Bio-Medical Library. A reference librarian then makes use of computer-based online bibliographic services to identify twenty-five to fifty citations pertaining to the topic of interest.

However, if in the librarian's judgment the results of the search were unsatisfactory, the search is supplemented by a query to another database or by a manual search. From the set of citations retrieved, the librarian selects the five or six best titles and submits them to a library assistant for paging. After these materials have been retrieved, the reference librarian then makes a final selection, choosing on the average four articles to be photocopied and mailed to the student. Requests received one day are, in nearly all cases, completed and mailed the next. Thus mailing time is the most significant factor in the user's wait time, and that waiting period averages five to seven days.

Subject requests are searched by reference librarians using either a Texas Instruments 785 terminal or an Execuport 300 terminal. Both terminals have built-in acoustic couplers for telephone access via Tymeshare or Telenet communication lines. The searcher may select one of two bibliographic services, the National Library of Medicine's (NLM) ELHILL system or Bibliographic Retrieval Services' (BRS) STAIRS system. Although both services provide a range of databases for the librarian, the majority (95%) of the literature searches for RPAP students can be performed by accessing MEDLARS at BRS or MEDLINE at NLM.

The flowchart in TABLE XXI describes the process by which literature searches for RPAP students are performed at Bio-Medical Library. The elements of the search process are similar to those described by Chenery.[9]

Several differences, however, should be noted. The literature requests are clinical in nature, with an emphasis on disease-related topics. Search formulation and strategy is relatively simple. As stated earlier, search formulation required an average of 2.08 major descriptors per search. Thus the average computer connect time including the interactive search and printing time is only 15 minutes. During a two month period, 33% of student requests were received by telephone. The average interview time per request was 2 minutes. Finally, because the primary product needed by the student is information, i.e., the journal article, formulation for high relevancy retrieves approximately twenty-five to fifty citations.

2. Cost Analysis

The objective of the cost analysis portion of the study is to identify the full value of the resources used in providing a library service to RPAP students. To that end, two main kinds of cost have been isolated: the direct cost and the indirect cost associated with performing the RPAP information delivery service. The sum of these two costs, the full cost, represents the full value of the resources used in the RPAP information delivery system. To ensure a clear understanding of the distinction between direct and indirect costs, each concept will be discussed in turn.

Certain costs, because they can be easily and directly attributed to the performances of a service, or the production of a product, are called

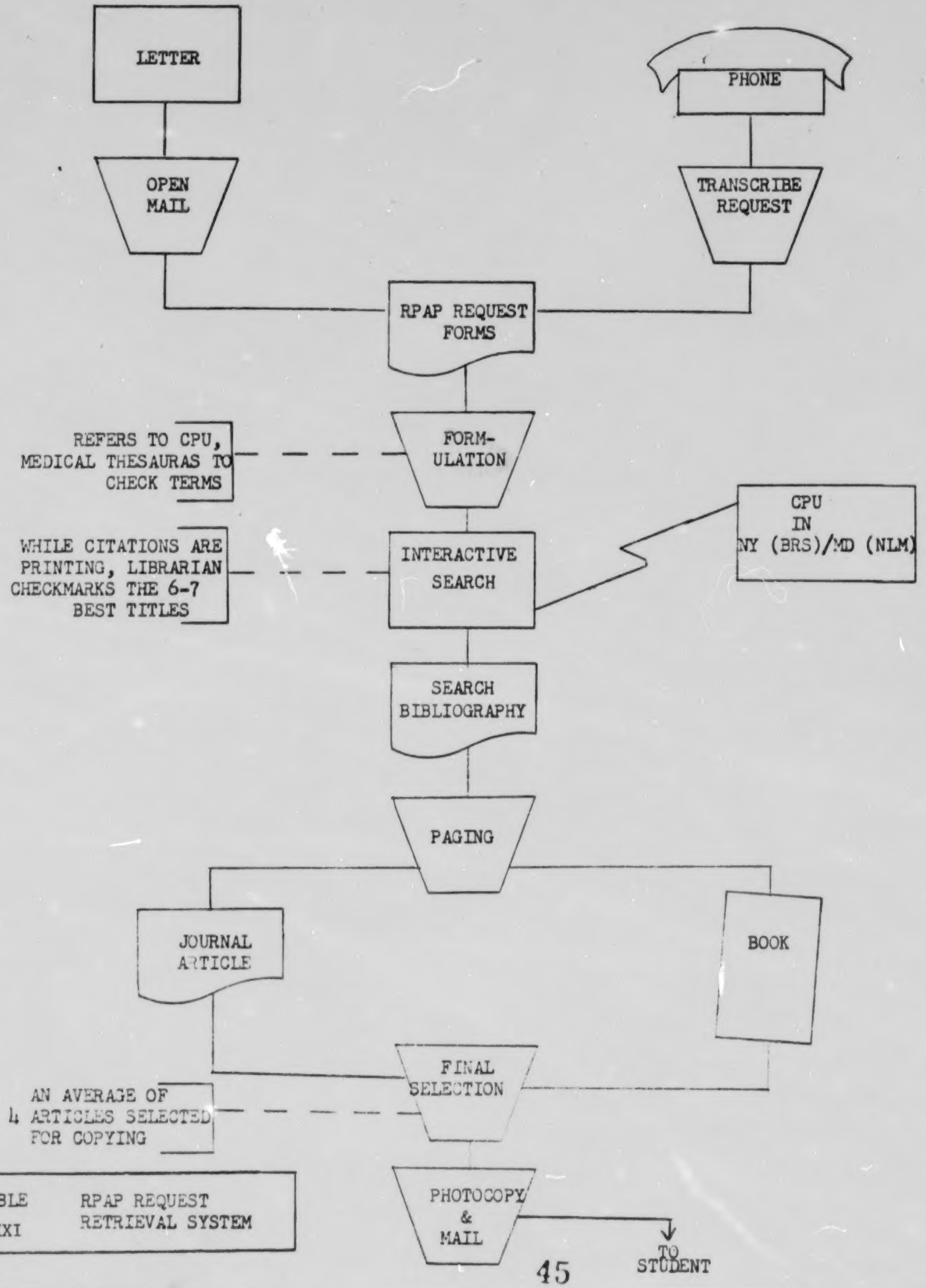

LETTER
PHONE
OPEN MAIL
TRANSCRIBE REQUEST
RPAP REQUEST FORMS
REFERS TO CPU, MEDICAL THESAURAS TO CHECK TERMS
FORM-ULATION
CPU IN NY (BRS)/MD (NLM)
WHILE CITATIONS ARE PRINTING, LIBRARIAN CHECKMARKS THE 6-7 BEST TITLES
INTERACTIVE SEARCH
SEARCH BIBLIOGRAPHY
PAGING
JOURNAL ARTICLE
BOOK
FINAL SELECTION
AN AVERAGE OF 4 ARTICLES SELECTED FOR COPYING
PHOTOCOPY & MAIL
TO STUDENT

TABLE XXI RPAP REQUEST RETRIEVAL SYSTEM

direct costs. The direct cost associated with the performance of a certain service often has several components, namely labor, equipment, and supplies. With respect to this study, the direct labor cost represents the monetary value of the personnel time devoted to performing the RPAP literature searches, that is, the value in dollars of the librarian's interview time, formulation time, and follow-up time, and the library assistant's paging time, and the library clerks reshelving time. The direct supplies associated with this service are the costs of postage, packaging, and photocopy paper that were incurred as a result of providing this particular library service. The cost of any equipment used in performing literature searches, such as the computer connect time and photocopy rental represent the direct equipment component of the direct cost.

In summary, then, direct costs are those costs which can be easily and directly traced to the performance of a service or a production of a product. For this reason, the identification of direct costs is frequently helpful in determing the cost/effectiveness of performing a particular service.

However, not all costs are direct costs. There are certain other costs that are essential to operations that cannot be traced in a direct way and must be allocated. Frequently these indirect costs are incurred for several services and thus are not directly related to the performance of a single service. Such indirect costs often are called overhead costs. Some examples of library overhead are the cost of heating and lighting, the cost of janitorial services, the cost of acquiring, cataloging, and binding library materials, the cost of certain administrative services such as bookkeeping and payroll and perhaps the cost of leasing and maintaining library equipment such as phtocopy machines and computer terminals.

These costs, though not directly attributable to the performance of particular services to library patrons, such as staffing a reference desk, or performing a literature search, nonetheless are essential to operations and must be paid. Thus the critical question in any discussion of indirect costs is how to determine a fair way to allocate the total indirect costs associated with operating a business, or in this case, a library. Generally, the rule of thumb applied is to allocate the indirect costs to each department, or employee, or service on the basis of benefit or service level received. For the purposes of this study, indirect costs have been allocated to the RPAP service on the basis of employee hours devoted to that service. The sum of the direct and the indirect cost associated with performing the RPAP service represents the full cost of this service.

TABLE XXII presents the average direct cost to the Bio-Medical Library per RPAP literature search. Because the requests require relatively uncomplicated search formulation and strategy and citations are limited to twenty-five to fifty, the cost per individual search cluster very closely about the mean; and thus the average direct cost also is a good indicator of the minimum and maximum in the range of search costs.

$C_{\text{DIRECT COST PER RPAP REQUEST}}$	=	$C_{\text{DIRECT LABOR}}$	+	C_{SUPPLIES}	+	$C_{\text{DIRECT EQUIPMEN}}$
$11.17		$6.72		$.72		$3.73

$C_{\text{DIRECT LABOR}}$

$C_{\text{LIBRARIAN}}$	(26 min/request @ $8.65/hr)	$3.75	
$C_{\text{JR. LIBRARY ASS'T}}$	(30 min/req. @ $5.49/hr)	$2.75	
C_{CLERK}	(4 min/request @ $3.25/hr)	$ .22	
SUM			$6.72

C_{SUPPLIES}

C_{COPIES}	$ .08	
C_{MAILINGS}	$ .64	
SUM		$ .72

$C_{\text{DIRECT EQUIPMENT}}$

$C_{\text{PHOTOCOPIER}}$	(26 pg/request @ $.027/pg)	$ .62	
C_{COMPUTER}	(15 min online/req @ $12.20/hr)	$3.05	
$C_{\text{TELEPHONE}}$	($.60/1000 lines printed)	$ .06	
SUM			$3.73

TABLE XXII DIRECT COST TO BIO-MEDICAL LIBRARY PER RPAP SEARCH REQUEST, 1976-1977

$C_{\text{INDIRECT COST PER RPAP REQUEST}} = C_{\text{INDIRECT LABOR}} + C_{\text{INDIRECT EQUIPMENT}}$

$7.84 = $7.22 + $.62

$C_{\text{INDIRECT LABOR}}$

$C_{\text{UNIVERSITY OVERHEAD}}$ ($6.72 direct salaries/request @ 43.4% salaries)	$2.92	
$C_{\text{BIO-MEDICAL LIBRARY OVERHEAD}}$ (1 labor hr equivalent/request @ $4.30/labor hr)	$4.30	
SUM		$7.22

$C_{\text{INDIRECT EQUIPMENT}}$

$C_{\text{PHOTOCOPIER}}$	$ .02	
C_{COMPUTER}	$ .32	
$C_{\text{TELEPHONE}}$	$ .28	
SUM		$ .62

TABLE XXIII INDIRECT COST TO BIO-MEDICAL LIBRARY PER RPAP SEARCH REQUEST, 1976-1977

$C_{\text{FULL COST PER RPAP REQUEST}}$	=	C_{LABOR}	+	C_{SUPPLIES}	+	$C_{\text{EQUIPMENT}}$
\$19.00	=	\$13.93		\$.72		\$4.35

C_{LABOR}

LIBRARIAN	\$7.24	
JR. LIBRARY ASS'T	\$6.09	
CLERK	\$ .60	
SUM		\$13.93

C_{SUPPLIES}

COPIES	\$ .08	
MAILINGS	\$ .64	
SUM		\$ .72

$C_{\text{EQUIPMENT}}$

PHOTOCOPIER	\$ .64	
COMPUTER	\$3.37	
TELEPHONE	\$ .34	
SUM		\$ 4.35

TABLE XXIV AVG. FULL COST TO BIO-MEDICAL LIBRARY PER RPAP SEARCH REQUEST, 1976-1977

		DIRECT COST	INDIRECT COST	FULL COST
LABOR				
	LIBRARIAN	$2345	$2182	$4527
	JR. LIBRARY ASS'T	$1719	$2090	$3809
	CLERK	$ 137	$ 239	$ 376
	SUM	$4201	$4511	$8712
SUPPLIES				
	COPIES	$ 50	----	$ 50
	MAILINGS	$ 400	----	$ 400
	SUM	$ 450		$ 450
EQUIPMENT				
	PHOTOCOPIER	$ 388	$ 12	$ 400
	COMPUTER	$1905	$ 200	$2105
	TELEPHONE	$ 38	$ 175	$ 213
	SUM	$2331	$ 387	$2718
SUM COSTS OVERALL		$6982	$4898	$11,880

TABLE XXV — ANNUAL COSTS TO BIO-MEDICAL LIBRARY FOR RPAP REQUEST RETRIEVAL SYSTEM - 1976-1977, @ 625 REQUESTS ANNUALLY

^{C}DIRECT LABOR

The major component in the cost of literature serching for RPAP students is labor. ^{C}DIRECT LABOR represents the monetary value of the labor time spent in performing a literature search. Thus the hourly costs per personnel time as given in the table include a fringe benefit figure of 19% of salary.

The greatest component of ^{C}DIRECT LABOR is ^{C}LIBRARIAN. The librarian time, from the formulation of the search request to the online interaction at the terminal, to the final selection of materials to be mailed to the student averages about 26 minutes per request and is figured at a rate of $8.65/hour.

The second element of ^{C}DIRECT LABOR is the library assistant's time. The assistant's job is to page the journals, photocopy and mail the selected articles, maintain all records, and to perform all the billing for the RPAP library service. The average time devoted to these tasks is 30 minutes/request.

The final element in ^{C}DIRECT LABOR is clerk time, the time devoted to reshelving all materials paged by the library assistant. This cost was figured at a rate of $3.25/hour.

^{C}SUPPLIES

This cost represents the monetary value of all supplies used in performing an RPAP search request. It includes the cost of the copy paper, the cost of the mailing envelopes, and the cost of the postage.

^{C}DIRECT EQUIPMENT

Certain costs associated with the use of the library equipment can be traced directly to the RPAP request retrieval service. ^{C}PHOTOCOPIER represents the actual cost incurred in making photocopies of journal articles for RPAP students. The cost to make a photocopy (excluding the cost of paper which is included in ^{C}SUPPLIES) is $.027/page.

^{C}COMPUTER represents the online connect time charges incurred when performing an RPAP literature search. Because all citations retrieved usually are printed online, the cost of printing the citations is embedded in the connect time charges. In addition, because the reference librarian has available to her either the NLM or the BRS systems, the average connect time charge reflects both systems' hourly rates of $15.00 and $9.10* respectively. About one-half of the 625 RPAP searches performed each year access the NLM system.

Finally, the BRS service requires that Bio-Medical Library utilize the TELENET telephone hookup resulting in an additional direct cost of $.60 per 1000 lines of print. This cost is represented by ^{C}TELEPHONE. Telephone charges incurred when accessing NLM databases are paid for by the National Library of Medicine.

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*The BRS contract entitles Bio-Medical Library to 70 hours of connect time per month at a charge of $9.00/hour. Any connect time in excess of 70 hours/month is available at a rate of $10/hour. Because Bio-Medical Library averages 75 connect hours/month the average connect hour rate is $9.10.

The direct cost to Bio-Medical Library per RPAP search request, then, is represented by the sum of these three costs: ^{C}DIRECTOR LABOR, ^{C}SUPPLIES, and ^{C}DIRECT EQUIPMENT. Thus Bio-Medical Library incurs a direct cost of $11.17 for every online seach performed for an RPAP student. This sum, however, does not represent the entire cost associated with the RPAP request retrieval system. Another type of cost, the indirect cost, must also be considered. Therefore, the indirect cost per RPAP search request has been given in TABLE XXIII.

^{C}INDIRECT LABOR

The indirect labor costs are those costs that are essential for operations but can not be directly traced to the RPAP request retrieval system. The two main components of this cost are a University of Minnesota overhead charge at a rate of 43.4% of salary, and the Bio-Medical Library's own overhead charge of $4.30/personnel hour. The University rate represents an allocation of the overhead costs associated with operating a major University. This cost includes the costs associated with certain university administrative services such as the general accounting offices, the cost of heat, light and janitorial services per square foot and so on.[*]

Bio-Medical Library's internal overhead rate of $4.30/personnel hour represents the cost associated with the acquiring, cataloging and binding of library materials, and the cost of certain administrative services at Bio-Medical Library, such as bookkeeping and payroll.

^{C}INDIRECT COSTS

The indirect equipment costs presented in TABLE XXIII primarily consists of the cost of leasing and the cost of servicing the equipment used in the RPAP service.[**] Thus a portion of the total leasing charge ($105/month) paid to Loonam Co. for the Texas Instruments 735 terminal is allocated to the RPAP request retrieval system. Likewise, a portion of both the monthly service charge on the Execuport 300 terminal and the photocopier, and a portion of the monthly telephone bill are allocated to the RPAP service on a percentage used basis.

TABLE XXIV summarizes TABLES XXII and XXII by presenting the average full cost per RPAP request, that is, the sum of the direct and indirect costs associated with performing an online literature search.

The same information is presented in TABLE XXV to show the accumulated direct and indirect costs for performing the 675 RPAP literature searches during the 1976-1977 school year.

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[*] The University overhead rate however does not include the cost to rent space. Thus rental is excluded from the indirect cost calculation.

[**] This study did not include depreciation in the calculation of indirect equipment costs.

3. Cost Evaluation

A full cost of $19.00 per search is remarkably low in comparison to costs per online search cited by others in the literature.[10-12] There probably are several reasons for this, among them wide variations in the practice of an online search, and regional differences in cost levels. Characteristics of this particular retrieval system also might have a beneficial impact with respect to costs, such as the fact that the RPAP requests themselves are relatively easy to perform, and that the responsibility for performing online searches resides exclusively with two well-experienced reference librarians. Even so, a look at the billing charges per RPRP search shows that Bio-Medical Library recovers only a portion of the full cost per search.

The Rural Physician Associate Program at the University of Minnesota Medical School is billed a flat rate of $6.00 per search and charged an additional $.10 per page of photocopy. The average RPAP request requires about twenty-five pages of photocopy, and thus the average bill per RPAP search is $8.50. The net loss to Bio-Medical Library, then, is $10.50 per search, or roughly $6560/year. Put in other terms, Bio-Medical Library contributes about $165 per student serviced by this program.

Several alternatives other than an increase in the billing rate might be considered to bring full costs in line with revenue, namely to reduce the costs of performing the same service, to reduce the service, or to eliminate the service. The advantages and disadvantages of each of these options will be examined in turn.

A direct cost saving could be realized by performing all the RPAP literature searches on the BRS STAIRS system. The BRS hourly connect rate at $9.10 is $5.90 cheaper than the NLM rate. Moreover, since 95% of these search requests can be satisfied either by MEDLINE or its counterpart, MEDLARS, there would be minimal reduction in service effectiveness. The net cost saving to Bio-Medical Library after taking this step would be about $1850 annually (313 NLM searches/year at $5.90/search), and would result in a new average full cost per search of about $16.10 * [$19/search - ($1850 savings ÷ 625 searches/year]

A further reduction in total cost could be realized if the online searches were not supplemented by a manual search. Because a manual search is performed for nearly 1/4 of the search requests, requiring about twenty additional minutes of reference librarian time, the annual time saved would be about 52 hours [(625 ÷ 4) x 20 minutes] thereby reducing the total direct cost for the RPAP service by $450/year. (52 hrs. @ $8.65/hr). Thus fewer employee hours spent in providing the RPAP request retrieval service means less overhead dollars allocated to the service. Referring to TABLE XXIII, then, this

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*The additional direct cost for the TELENET hookup required by the BRS service averages $.06/search.

$450 annual reduction in salary costs means a $195 annual reduction in the University's overhead allocated to the service (43.4% x $450), and a $224 annual reduction in Bio-Medical Library's overhead allocated to the service (52 hrs. @ $4.30/employee hour). The annual full cost reduction, therefore, is $869 ($450 direct + $419 indirect).

The net effect of these two efforts would be to reduce the average full cost per search from $19 to about $14.70. [($1850 annual direct cost saving + $869 annual full cost reduction) ÷ 625 searches/year] and to reduce the average direct cost per search from $11.17 to about $7.50 [($1850 annual direct cost saving + $450 annual direct cost reduction) ÷ 625 searches.] Thus the average bill per RPAP literature search of $8.50 would now cover 100% of the direct costs associated with the retrieval service and would also contribute $1.00/search or 14% toward the indirect cost allocated to the service.

D. Summary and Implications

Bio-Medical Library currently provides an information retrieval service for 40 RPAP students in which the student may submit a request for material on a topic of interest and then, upon fulfillment of the request, receive that material 4-6 days later. The effectiveness of the service has been demonstrated by the students' evaluation of the medical information received. Moreover, the online searches performed for the students average only about 15 minutes. It is not clear from this study, however, whether the speed with which the online searches are performed reflect the simplicity[16] of the search request, or the economy with which two experienced reference librarians can perform online searches. Further research into the advantages and disadvantages of dispersing online searching responsibility would therefore be beneficial.

The costs associated with performing this retrieval service have been presented in some detail in TABLES XXII - XXV. Currently, a direct cost of approximately $11.20 and a full cost of $19.00, are incurred per RPAP retrieval request. Although these costs are somewhat low in comparison with similar searches discussed in the literature, the relevant issue for Bio-Medical Library is not the relative economy of its online searches, but the effectiveness of its services as related to costs.

The cost analysis identifies changes that would reduce costs: (1) perform all RPAP searches on BRS, and (2) eliminate the manual search. Although the cost reduction is significant, implications for service must be considered. First, service to RPAP must be viewed within the context of the total literature search services provided. Bio-Medical librarians perform an average of 250 literature searches per month during those hours when they are not assigned to the reference desk. It would be necessary to alter present staffing patterns if all RPAP searches were processed on BRS. Because RPAP searches are appropriate for either MEDLINE or MEDLARS, they can be done on MEDLINE thus making the BRS system available for searching other databases. Priority of the RPAP requests must be weighed against no less urgent requests of other patrons. By using both systems, the demands of both RPAP and other patrons can be met. Furthermore, the BRS STAIRS program is more flexible than is the ELHILL program. If the RPAP request requiring less interactive search manipulation is done on MEDLINE, BRS is available for those searches requiring its program capabilities.

The costs associated with providing this flexibility of service and the implications of staffing are beyond the scope of the present study, but they are recognized.

Secondly, RPAP students request information, not bibliographies. If the computer search did not retrieve a relevant citation, without a manual serach the student would not receive information. As shown earlier, Bio-Medical Library is not the first resource used by the student. When a request is received by Bio-Medical Library, the librarian must assume that the student has exhausted other resources. Without the manual search, Bio-Medical Library could be one more failure in an attempt to find information. For librarians dedicated to providing information, this has serious implications for service. But if a method for assuring information access is to be found, costs must be considered.

The costs of online literature searching have been identified and discussed in the literature; however, the design of an adequate pricing structure usually is not addressed. Kochtanek, in his article titled, "Basic Issues in Designing a Pricing Structure for Library and Information Services" puts the matter bluntly when he states: "Those who benefit should pay." But in the health sciences, who benefits is a question: the student? the medical school? the health science library? or the patient? Another question is left unanswered: pay how much? the direct costs only? the direct cost and a portion of the indirect costs? or the full costs of the service? Or is access to information a right of the citizen, rather then a commodity to be purchased by those who can pay?

Raymond P. Lutz, in his article, "Costing Information Services" addresses some of these questions. He also considers the impact of price on user demand, and the influence of the funding agency on the determination of the pricing structure. Further research into the question of the costing and pricing of information services is still needed.

In terms of personnel resources, too, services of the type and quality provided to 40 medical students are quite costly. The thought of a single library such as Bio-Medical Library, although a major source of medical information in the state, supplying information services to individuals throughout Minnesota, as in the RPAP system, is nearly unimaginable. Bio-Medical Library's resources would be drained quite easily in such an effort. Therefore, it is useful to consider alternative systems that are both feasible and effective. Library services available for the community also would be available for the student studying in the area. Section B examines the types and level of information services that would be provided by two regional systems of information delivery.

Section B. Regional Systems of Information Delivery

I. Introduction

A review of the literature suggests the variety of systems designed to deliver medical information to health care personnel in non-metropolitan communities. The community hospital library, which ten years ago was estimated as numbering slightly over 1,000 in the United States,[1] actually represents only one of the several possible systems of providing access to medical information. A cluster of community hospital libraries staffed by a circuit librarian can provide library information services to that region previously not possible by each of the community hospital libraries alone.[2] A consortium of medical libraries and institutions again provides unique benefits and services to its members, and to its health professional clientele.[3] Even within the information delivery site itself, the role of the reference librarian can be expanded to encourage the creation of a new classification for this model of information delivery.[4] Such has been the case with the initiation of learning resource centers in the State of Minnesota. Finally, action by the U.S. legislature in 1971 authorized the establishment of the Area Health Education Center (AHEC), aimed at improving the "distribution, supply, quality, use and efficiency of health care personnel."[5]

From among the various possible medical information delivery systems, two were selected for this study: the learning resource center and the consortium. Several factors make these two systems particularly attractive for study. In the case of the former, two pilot learning resource center projects have recently been initiated in non-metropolitan Minnesota communities in direct response to the increasing need of health professionals for educational support services near the site of practice. Although the learning resource center, as developed and tested in Minnesota, is still in its incipient stages, mandatory continuing education requirements make this concept of practical interest.

The library consortium, by its very prevalence in the Midwest, suggests itself for study. In addition, recent trends[6] encourage the exploration of viable, decentralized systems for the delivery of medical information.

II. Research Methodology: The Use of Models

The objective of this portion of the research study, Section B, is to provide decision-makers with relevant information about the nature, desirability, and economic feasibility of two particular medical information delivery systems. Thus, the function of the research is as much to present a framework for the analysis of each delivery system as to gather and organize data about each system. To accomplish the stated objective, a model of each information delivery system is constructed, and the various services and operating costs associated with each system are identified. Finally, a discussion of the critical decision factors affecting the operation, service, and cost of the two delivery systems is included at the close of the section. To begin, the question: "What is a model?" needs to be addressed.

Administrators responsible for planning decisions involving the effective use of resources make forecasts about future conditions in the light of information about the present. In order to make such decisions, the administrator must identify and weigh the numerous variables that have an impact on the alternative under consideration. He must examine the relationship between those variables, and then weigh them against particular decision objectives. This entire process is actually a form of model building.[7] The administrator has contructed a model, a "simplified representation of the relevant aspects of an actual system or process."[8]

In order to make a decision, then, the decision-maker makes use of a more simplified picture of reality. He reduces the number of variables affecting a decision alternative by making certain assumptions about future events, decisions, and trends. The model so constructed is useful because it is simple, and because it shows how things work. A model used in this way is of value to the extent that it defines a situation more clearly, and suggests the consequences of a decision alternative.

The ability of the model to suggest the future consequences of a decision depends to a large extent on the assumptions on which the model is based. In the construction of the two models of information delivery described in this report, certain assumptions have been made about the relationship between collection size and optimal physical capacity, between collection size and interlibrary loan activity, between hospital bed size and level of library service demanded, and so on. In each case, the literature was searched for guidelines in the formulation of the assumptions. Whenever appropriate guidelines were found, they were employed. However, it can be pointed out that studies examining the relationship between variables associated with library service have been few.

III. The First Model: The Learning Resource Center

The purpose of the learning resource center, as developed and tested by the University of Minnesota Health Sciences,[9] is to provide direction and support for the continuing education of health professionals in non-metropolitan communities. The center therefore provides the health professional with a cluster of services ranging from access to medical information, to guidance in the development of a directed learning plan. The critical factor, then, that distinguishes the learning resource center as described in this paper, and other systems of medical information delivery, such as the community hospital library, is the nature and scope of the service provided by the center.

To provide this cluster of services, the learning resource center utilizes a number of resources. The primary resource of the center is the resident educator/librarian (Appendix 13) whose function is to carry out the full range of services available at the center. The other two major resources employed by the center are its collection, comprising both print and non-print materials, and its funding. These three, taken together, enable the center to support the continuing education of health care providers and students. A model of such a center is constructed in the following pages.

A. ASSUMPTIONS*- The learning resource center model is based on the following assumptions:

1) The learning resource center is located in a community hospital with a bed size of 100-300.[10]

2) The physical size of the learning resource center is 750 square feet[11] and seating capacity is available for fifteen readers.

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*Assumptions are based, in part, on the Lake Region Hospital LRC, Fergus Falls, Minnesota

3) The center is staffed by a full time resident educator/librarian, and one half-time resource clerk.

4) The collection consists of 300 (primarily reference) books, 50 current journal subscriptions, and 75 audio-visual programs.

5) The budgeted growth of the collection provides for an additional 20 book titles, three journal subscriptions, and three audio-visual programs each year.

6) To facilitate the use of the A.V. programs, and to ensure immediate access to medical information, the center owns an assortment of A.V. hardware, and leases a computer terminal.

7) Use of the computer terminal for online literature searches requires a long distance telephone call to a resource library located about 100 miles away.

SERVICES - In keeping with the broad objective of providing educational support to health professionals, the learning resource center model provides a number of services to its patrons. These services can be grouped into several classes: information searches, reference service, educational support services, and collection development.

The searches performed at the resource center model include manual, online, and A.V. resource searches. Online queries to MEDLINE and other databases provide the health professional with immediate access to bibliographical listings pertaining to a subject of interest. Using indexes and other reference sources the manual and A.V. resource searches can be performed. The primary purpose of the first type of service is to identify specific sources of medical information for the patron.

Reference service provided at the resource center would include both the answering of a patron's specific questions, and the performance of LATCH (Literature Attached to Charts). A LATCH is provided at the request of a physician or another member of the health care team when a patient has an unusual disease or problem. Information concerning the problem is then located and placed on the patient's chart within twenty-four hours of the request. That information is then available to all members of the patient care team.

Other kinds of reference service available at the center include two current awareness services. They are SDI and Audio-Visual Update (UPDATE). SDI (Selective Dissemination of Information) is an awareness service whereby the user requests current information on a specific subject, on a continual basis. The resident educator/librarian formulates the initial search and at regular intervals sends a bibliographic listing of the relevant titles to the patron. The Audio-Visual Update service notifies users by memo of the A.V. programs currently available at the center.

The third class of service provided at the Learning Resource Center model, eudcational support services, consists of those services in which the resident educator/librarian assists in the formulation and development of directed learning plans for the health care provider. Inservice Assistance is designed to aid the health professional responsible for planning inservice programs in the identification of the specific personnel needs, the inservice objectives, and the materials available to support the inservice program. The Personalized Learning Plan is another tool for assisting health care providers to systematically plan for the fulfillment of personal learning objectives. The resident educator/librarian assist the health professional in each step of the plan, in the identification of needs and objectives, in the selection, location, and scheduling of resource materials, and in program evaluation.

A fourth service is the development of maintenance of the book, journal and audiovisual collections. Careful selection to assure access to material while retaining an optimal size is a fundamental and important responsibility of the educator/librarian.

These four types of services, information services, reference service, collection development, and educational support services, represent the major functions of the learning resource center model.

RESOURCES -The projected annual cost of the learning resource center model is given in TABLE XXVI.

The primary resource of the center is the resident educator/librarian. The function of the resident educator/librarian, broadly stated, is to assist the health professional in accomplishing self-directed learning objectives. He or she does this by providing services ranging from the access to medical information to the development of a personalized learning plan. Therefore, the resident educator/librarian has a Masters in Library Science and commands a working knowledge of the application of educational principles and methods. The annual salary for this position is $14,500.

Assisting the resident education/librarian is a half-time resource clerk, whose function is to maintain records of the center's collection, to handle requests for audio-visual materials and to provide assistance in other tasks by typing correspondence, filing, and operating A.V. equipment. The annual budget for the resource clerk is $4,000.

The model center's collection comprises print and non-print materials. Given a hospital bed size of 100-300, the volumes owned by the center represent primarily a reference collection. Non-print materials consist of an assortment of A.V. programs, including slides, film strips, tapes, and video cassettes. Because collection development has been set at 20 books, 3 new journal subscriptions, 50 current subscriptions, and 3 A.V. programs, the annual expenditure for collection development amounts to $600 for books, $1,855 for journals, and $400 for A.V. programs.

To support the use of the various A.V. programs and to assist in the access to medical information, the model center is equipped with a range of A.V. hardware and leases a computer terminal. The collection of A.V. hardware includes video cassettes and audio cassette players, color video monitors, an overhead projector, slide projectors, and a 16mm projector. The annual maintenance cost for this equipment is $150, and an annual allowance of $400 is set aside for the purchase of replacement equipment.

The leasing costs for the computer terminal alone costs $1250 annually, and an additional $900 cost is incurred at the center for the computer connect time required to support 180 MEDLINE searches annually (@ $15/hour).

PROJECT ANNUAL COST
FOR
LEARNING RESOURCE CENTER MODEL

(1977-1978)

SALARIES AND WAGES	
Resident Educator/Librarian (F.T.)	$14,500
- Frince (19%)	2,755
Resource Clerk (H.T.)	4,000
RENT, HEAT, LIGHT, JANITORIAL SERVICES (750 sq. ft. @ $7/ sq. ft.)	5,250
COMPUTER TERMINAL LEASE	1,250
CONNECT HOUR ONLINE (20 min/search @$15/hr @ 180 searches/yr)	900
OFFLINE PRINT CHARGES (10 pg/search @$.15/pg)	270
TELEPHONE HOOKUP CHARCES (20 min/search @$.46/min)	1,640
COLLECTION DEVELOPMENT COSTS	
Books (20 @ $30/ea.)	600
Current Journal Subscriptions (50 @ $35/ea.)	1,750
New Journal Subscriptions (3 @ $35/ea.)	105
A.V. Programs (3)	400
EQUIPMENT MAINTENANCE	150
EDUCATIONAL COSTS	
Ed Tools for resident educator/librarian	150
Meetings, travel, memberships	350
MISCELLANEOUS SUPPLIES	350
MISCELLANEOUS CHARGES	
Telephone	250
Photocopy	300
Postage	250
ILL Service	100
BUDGETED PURCHASE OF EQUIPMENT	400
PROJECTED ANNUAL COST	$35,720

TABLE XXVI: PROJECTED ANNUAL COST FOR THE LEARNING RESOURCE CENTER MODEL, 1977-1978

Moreover, telephone hookup charges to a major resource library within the state per 20 minute online search amount to $9.13, thereby yielding an annual telephone cost of $1640.

Finally, the center, in requiring 750 square feet of space, incurs an annual overhead for rent, heat, light, and janitorial services totaling $5250. The annual cost required to support the model learning resource center is therefore $35,7200.

B. A Major Resource Library's ILL Service to the Model

Essential to a thorough understanding of the learning resource model, and the community hospital library for that matter, is to recognize that their proper function is not to be a storehouse of medical information. Rather, their function is to provide the health professional with access to that information. This goal is achieved by equipping the center with a variety of tools: indexes, catalogues, a set of reference volumes, an online terminal, and by staffing the center with a person familiar with the respective uses and limitations of these tools. The resident educator/librarian assists the health professional first in the identification and formulation of the specific information desire, and then in the location and delivery of the desired materials. Satisfactory completion of this second step requires that the resident educator have recourse to a core collection and to interlibrary loan services.

ASSUMPTIONS - The following assumptions about the model learning resource center's level of ILL activity have been made:

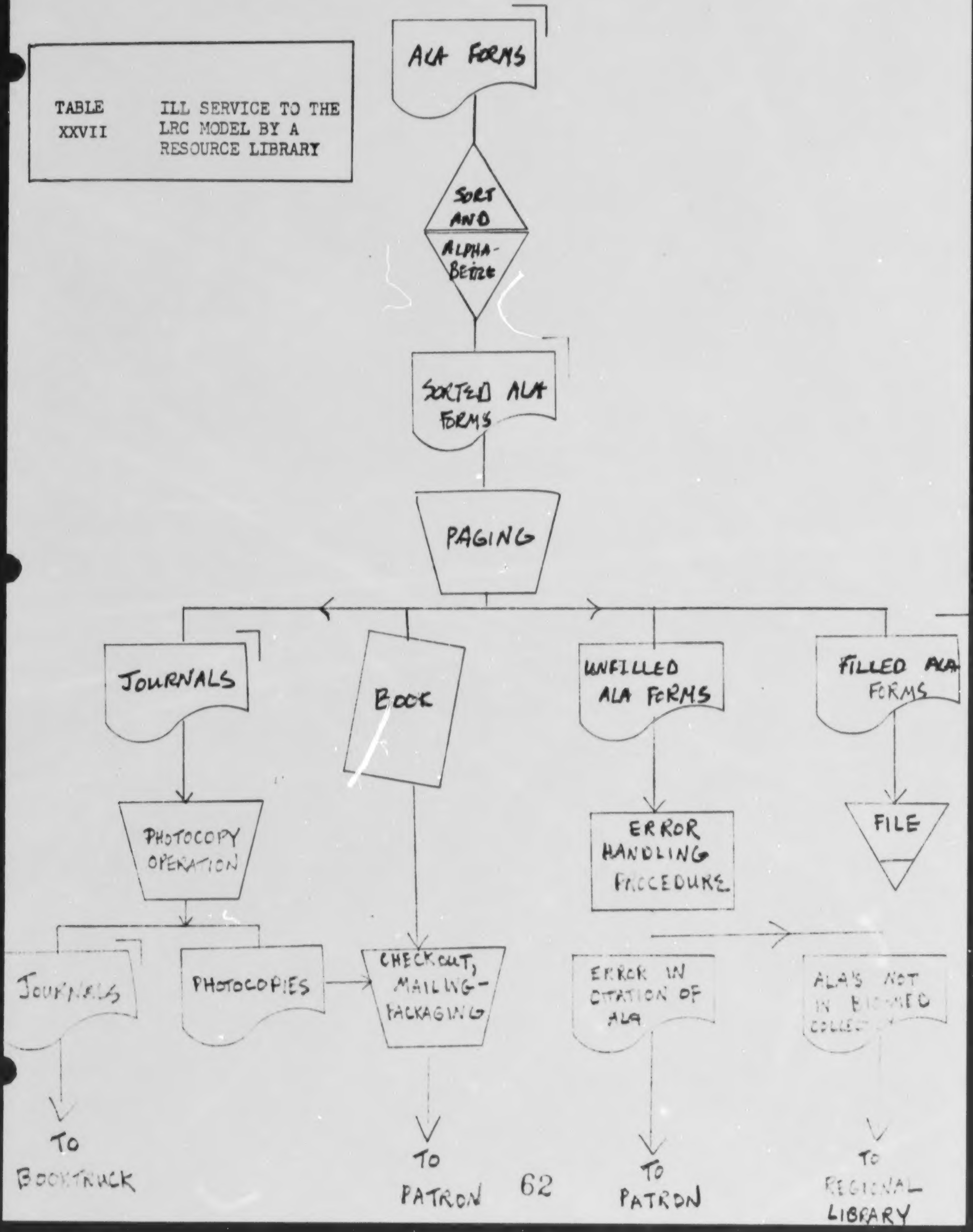
1. Given a hospital bed size of 100-300 and an online terminal available at the center, it is assumed that the center handles an average of 100 interlibrary loans per month.

2. The center forwards the ILL requests either to nearby community sources of medical information or to one of the three Resource Libraries in the state.

3. Of the 100 ILL requests/month, it is assumed 30 are forwarded to a major resource library.

SERVICES AND COSTS - The flowchart in TABLE XXVII diagrams the general steps taken to fill an ILL request, from the learning resource center model, at a major resource library. The diagram on the following page, TABLE XXVIII shows the direct and indirect costs associated with filling the average ILL request[12] from the resource center model. It can be seen that if the learning resource center averages 100 ILL requests/month, and of these, 30 are forwarded to a Resource Library, then the sum cost of that Resource Library's ILL service to the center is $1462/yr (30 x 12mos) @ $4.06.

TABLE XXVII ILL SERVICE TO THE LRC MODEL BY A RESOURCE LIBRARY


ALA FORMS
SORT AND ALPHABETIZE
SORTED ALA FORMS
PAGING
JOURNALS
BOOK
UNFILLED ALA FORMS
FILLED ALA FORMS
PHOTOCOPY OPERATION
ERROR HANDLING PROCEDURE
FILE
JOURNALS
PHOTOCOPIES
CHECKOUT, MAILING-PACKAGING
ERROR IN CITATION OF ALA
ALA'S NOT IN BIOMED COLLECTION
TO BOOKTRUCK
TO PATRON
TO PATRON
TO REGIONAL LIBRARY

PERSONNEL		
LIBRARIAN (4.78 min/req @ $.1078/min)	$ .52	
LIBRARY ASS'T (9.57 min/req @ $.0828/min)	.79	
CLERK/TYPIST (9.57 min/req @ $.0676/min)	.65	
SUM		$1.96
MATERIALS & CHARGES		
POSTAGE (insurance excl.)	$ .06	
SUPPLIES	.20	
PHOTOCOPY	.38	
SUM		$ .64
INDIRECT COST		$1.46
AVERAGE COST PER ILL		$4.06

TABLE XXVIII AVERAGE COST PER ILL REQUESTED FROM A RESOURCE LIBRARY, 1976-1977

C. Major Influences on the Model's Cost and Operation

In order to construct a model of a learning resource center, certain assumptions have been made to reduce the number of variables affecting the operation of the center. As a result of these assumptions, it is possible to project costs associated with the operation of the center and the backup service provided by a resource library. It can readily be seen that a different set of assumptions would yield a different set of costs. For this reason, it is useful to consider the relationship between some of the more critical assumptions and the level of operating costs at the center.

With respect to this model, it has been assumed that a relationship exists between hospital bed size and volume of activity at the learning resource center, and further, that a particular bed size suggests an appropriate collection size. However, the actual volume of activity realized by the center may vary from month to month and from year to year. Accompanying these changes in volume will be changes in the level of some of the costs associated with the center. As a result, the projected annual costs for the learning resource center presented in TABLE XXVI is appropriate for only one given volume of activity. For this reason, it is useful to consider projected cost behavior over a range in volume, as well as cost level at a particular volume. A few definitions are therefore in order.

Some costs are termed fixed costs because the total cost incurred will not change despite significant changes in the volume of service demanded at the learning resource center. Instead, the totals of these costs remain fixed over a relevant range in volume. Examples of such costs are rent, heat and light and janitorial services per square foot, and perhaps the annual lease for the computer terminal.

Other kinds of costs are termed variable because the total cost incurred varies directly with changes in volume. A good example of a variable cost would be the online connect time charges, the accompanying telephone hookup charges, and the offline print charges incurred when performing an online literature search. If online searching activity were to double the total of these costs would double also; if it were to drop 25%, so also would the level of these costs. Therefore, these costs are called variable.

The final type of cost to be considered is the mixed cost. Some costs are called mixed because their behavior is neither fully fixed, nor fully variable. Instead, these costs rise or fall in a step-wise fashion with changes in volume. A good example of a mixed cost would be the cost associated with employing the resource clerk. A learning resource center may employ a resource clerk in a quarter-time appointment for a particular range in the level of service demanded at the center. Then, if the volume of activity were to rise to a certain point, say to the point at which 400 patrons are serviced a month, the center might double that clerk's hours thereby making the position a half-time appointment. For a given volume interval, then, the total cost incurred for the resource clerk will remain fixed. However, when volume rises or falls beyond a certain point an abrupt change in the employement of the clerk is necessary. After that point, the cost will remain fixed at the new cost level for another interval. The toal cost incurred for the resource clerk then does vary with changes in volume, but it varies as a result of an administrative decision in response to that volume change.

Figure I on the following page presents three graphs of the probable behavior of the costs that were itemized in TABLE XXVI for the learning resource center model. The vertical axis on each graph displays costs to the center in thousands of dollars, while the horizontal axis presents various volumes of activity at the center measured in terms of patrons use. A patron is considered to use the center if he uses one of the materials in the collection, or any one of the services offered by the center. It is assumed that the relevant range in volume, that is, the range in which fixed costs remain fixed, is between 1200 and 6000 patrons served annually. No costs have been projected for volumes outside this range.

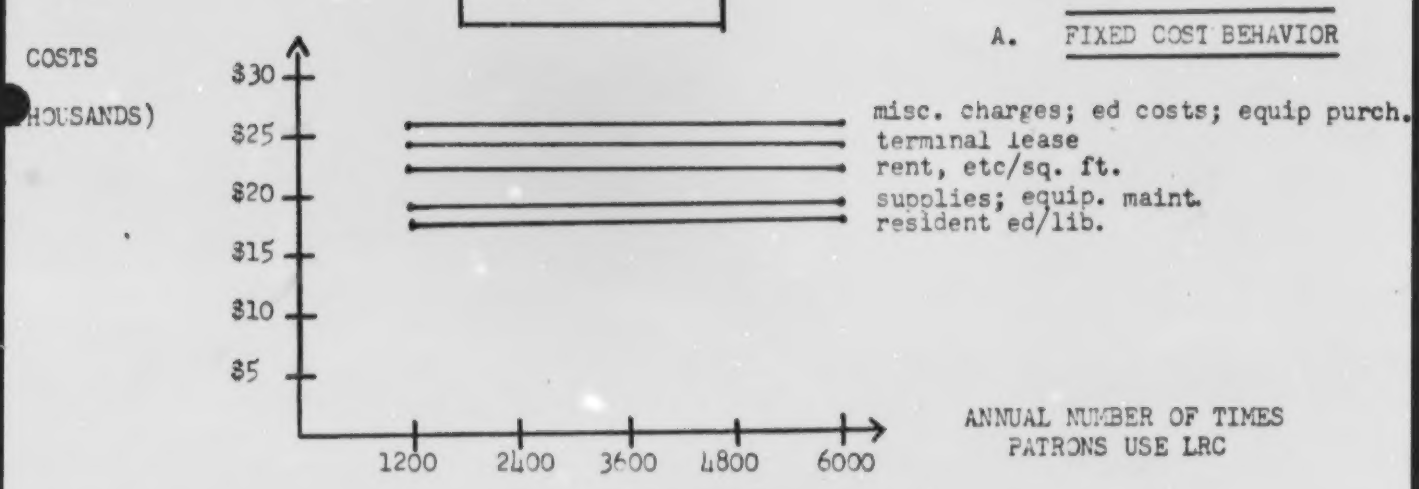
Graph A in Figure I depicts the probable behavior of the fixed costs associated with the learning resource center model over a relevant range. It has been assumed that the sum of these five component costs: the salary of the resident educator/librarian ($17,755); the cost of supplies and equipment maintenance ($500); the cost of rent etc/square foot ($5,250); the terminal lease ($1,250); and the miscellaneous charges, the education costs and the budgeted cost of equipment purchases ($1,800); will remain fixed for volume ranges between 1200 and 6000 patrons served annually. The sum of these fixed costs totals $26,055.

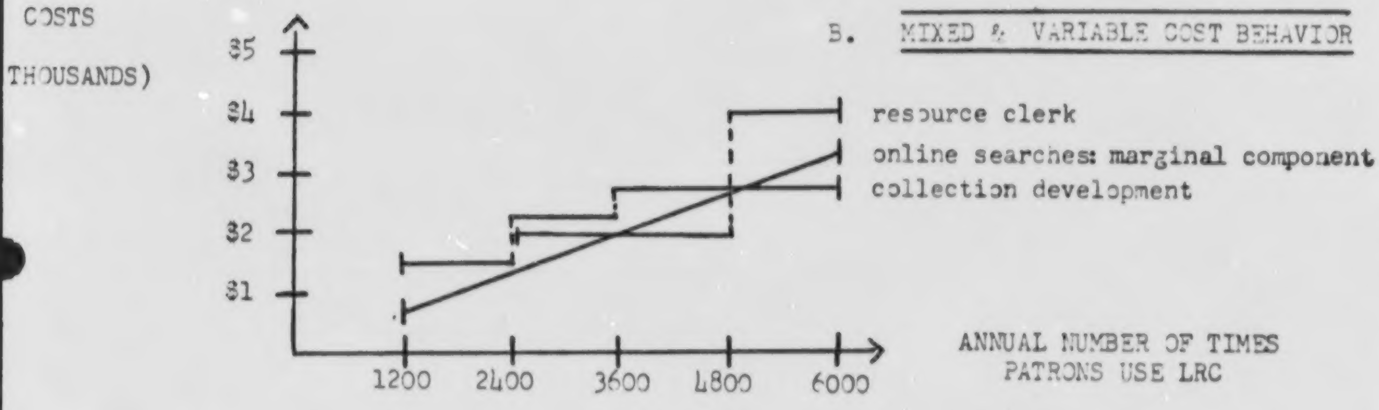
Graph B in Figure I presents the probable behavior of three of the more significant variable and mixed costs associated with the LRC model. The one variable cost presented, that of online searches, represents only the marginal cost component of an online search, that is, the online connect time charges, the telephone charges, and the offline print charges per search. Given a 20 minute average search time, online charges amount to $5/search (@ $15/hr), telephone charges to about $9/search (@ $.46/min), and offline print charges to $1.50/search (10 pg/search @ $.15/pg). Thus the marginal cost per online search is $15.50. If 3.5% of the total patrons served request online searches, then the marginal cost per search behaves in the manner presented in Graph B. Note that the total of this variable cost changes automatically as it were, in response to changes in volume, unlike a mixed cost whose total changes as a result of a decision maker's intervention.

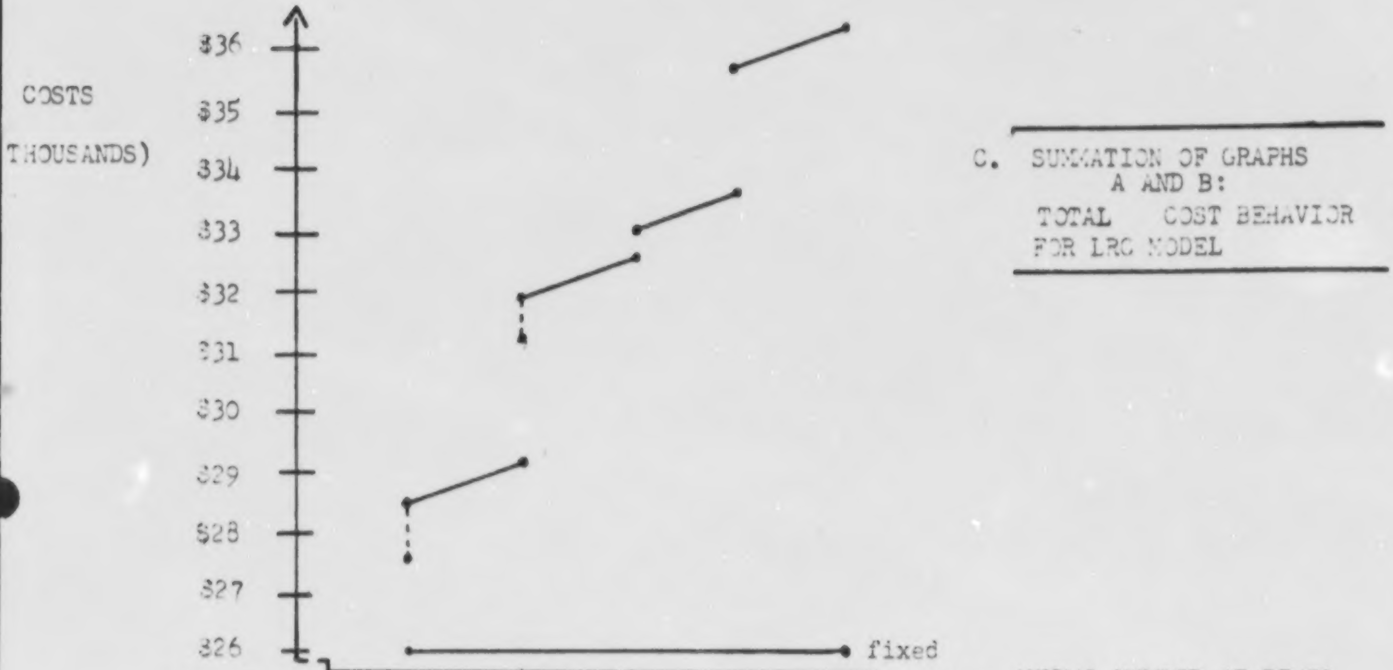
The two mixed costs presented in Graph B are the costs associated with the resource clerk and collection development. In the case of the resource clerk, it is assumed that that position is initiated as a quarter-time appointment ($2000/annually) between volumes of 2400 and 4800 patrons served annually. For volumes greater than this (within the relevant range) the appointment is shifted to half-time.

Three distinct cost levels are projected with respect to collection development. At the first and lowest level, it is assumed the only collection cost is the cost of the current journal subscription ($1,750). However, when the number of patrons served reaches 2400/yr it is assumed a decision would be made to supplement the journal subscriptions with a set of book purchases (20 @ $30/ea), thereby causing the collection development costs to jump by $600 to $2350. It is assumed the final addition to the collection would be made when the number of patrons served annually reaches 3600 (300/month). At this point, collection development costs would reach their full level of $2,855.

FIGURE I


A. FIXED COST BEHAVIOR


B. MIXED & VARIABLE COST BEHAVIOR


C. SUMMATION OF GRAPHS A AND B: TOTAL COST BEHAVIOR FOR LRC MODEL

Graph C at the bottom of Figure 1 is a summation of graphs A and B and thus represents the total cost behavior of the LRC model for volume ranges between 1200 and 6000 patrons served annually. The significance of this graph is that it helps to demonstrate a probable cost behavior for the learning resource center model over a range in the volume of service demanded. It should be noted that not all of the costs identified in Graph C will always be relevant nor will always behave in the same way for every learning resource center. In some cases physical capacity costs will be irrelevant because space has been donated free to the center. In other cases a different set of collection development decisions will cause this mixed cost to behave differently. For example a portion of the cost of each of the three kinds of collection materials might be incurred as the activity level at the center increases, instead of incurring these costs sequentially as was presented in this model.

The final graph in Figure I therefore may be a poor predictor of the cost behavior of a learning resource center in the actual case. However, what it does accomplish is to demonstrate the relationship between volume factors and decision factors, and to indicate a probable impact of these factors on cost levels at a learning resource center model. A comparison of the total annual cost for the center model presented in TABLE XXVI, and the graph of the total cost behavior over a range in volume presented in Graph C shows that the total annual cost from TABLE XXVI of $35,720 is appropriate for an activity level at the high side of the relevant range. The cost figures from TABLE XXVI are therefore valid, given assumptions on which the model is based, for a learning resource center servicing 4800 patrons annually.

Section B.

IV. The Second Model: The Library Consortium

A. The Model

The purpose of the library consortium is to improve access to medical information within a geographical area by pooling the resources of those libraries.[13] The scope of this sharing of resources can range from the establishment of interlibrary loan services among the member institutions, to the publication of a consortium union list of serials or volumes, to the establishment of a joint acquisition program. The underlying assumption governing the support of the consortium concept is that through cooperation, a member of a consortium can provide a higher level of service to its clientele, at a marginal increase in cost.

In practice, membership to a consortium may include a variety of institutions such as hospital libraries, college or university libraries, mental health clinics, public libraries, and federal, state or county departments or agencies. Thus the shape and scope of the services shared by the consortium depends to a large extent on the expectations, interests, and resources of its members. However, as a general rule, the individual consortium member may conceivably extend to its patrons the combined collection resources, and a number of the services of its fellow consortium members. For its part, the member institution may be assessed a membership fee, but more commonly contributes personnel time and expertise in exchange for the benefits of belonging to the consortium. A model of a hospital library that is a member of a consortium is constructed on the following pages.

Assumptions

The assumptions on which this model of a consortium member institution is based are the following:

1. The consortium member is a health science library situated in a community hospital of 75-150 beds.[14]
2. The library is staffed by a 3/4 time hospital staff member.
3. The physical capacity of the library is 400 square feet[15] and has a seating capacity for 10 readers.
4. The library collection consists of 20 current journal subscriptions, 200 volumes, and 10 audio-visual programs.
5. The budgeted growth in the collection provides for an additional journal subscription, and 15 new volumes annually, and an additional audio-visual program every two years.
6. The A.V. equipment owned by the library is a slide projector and a tape player.
7. The hospital library is a member of a library consortium spanning a three county area, and consisting of 10 - 15 institutions.

8. The consortium provides interlibrary loan (ILL) service, reference service, MEDLINE service, and free photocopy service to its members.

9. The consortium maintains a union list of serials for its member institutions.

Services

The model hospital library as an autonomous supplier of medical information provides certain services to its patrons. As a member of a consortium, that same library is able to extend a wider range of service to those patrons. Thus, in order to identify the full range of service provided by the model library, the services provided by the consortium of which it is a member must also be considered.

The primary service the consortium model provides to its members is an ILL service, whereby any member institution can telephone a request for an audio-visual program, serial, or volume, and if filled, can receive the material within 2-3 days. To enhance the efficiency of that service, the consortium model maintains a list of the serials owned by its members and provides each with a current copy of that holdings list. Consortium meetings held four times annually are for the purpose of discussing common problems, and ensuring the attainment of common objectives. Among the educational activities sponsored by the consortium model are two workshops annually, focusing on such topics as the use of MEDLINE, and new audio-visual programs. Currently, the consortium is discussing a mechanism for the assessment of its member institutions, and the feasibility and desirability of a joint acquisition program.

The organization of the consortium model is a decentralized one, utilizing a committee structure.[16] Working committees carry out long-range tasks of the consortium, such as the maintenance of the union list of serials. The executive committee is made up of representatives from each of the standing committees, and is responsible for administering the activities of the group. A chairperson directs the executive committee.

As an individually functioning hospital library, the model library provides to its patrons the following services: reference, manual searches, photocopy service and interlibrary loan service. As a member of a consortium the model library extends the following services to its patrons: an expanded interlibrary loan service, MEDLINE service, and a backup reference service.

Resources

Because of its membership in a consortium, the model library can provide to its patrons certain services otherwise not available, or not available as rapidly. In addition, the personnel staffing the library also directly benefits from certain other services such as educational activities sponsored by the consortium. To support the services to its patrons, and in exchange for the benefits of consortium membership, the model hospital library expends certain resources. Of these, the primary resources are: its personnel, the library collection, and funding.

A medical records secretary staffs the library 30 hours weekly. During that time she orders and organizes new publications, responds to patron reference questions, performs manual searches, maintains the records of the collection, forwards ILL requests, and ensures the efficient operation of the library. As a result of membership in the consortium, the medical records secretary attends general consortium meetings four times annually in a nearby metropolitan area and attends two annual workshops, all at hospital expense. Finally, the medical records secretary is a member of the union list of serials committee which meets three hours monthly, and whose major function is to ensure the accurate and up-to-date recording of the journals owned by consortium members. The annual budget for the 3/4 time medical records secretary is $9,818.

Maintenance of the hospital collection requires an annual expenditure of $35 for a new journal subscription, $450 (15 volumes @ 30/ea) for books, and $75 put aside toward the purchase of a new A.V. program. Current journal subscriptions amount to $700 annually (20 @ $35/ea). The sum maintenance cost of the collection therefore is $1260 annually.

The remainder of the total annual cost includes miscellaneous charges and supplies, annual maintenance service for the slide projector and tape player, educational costs, and finally, the cost per square foot for heat, light, rent, and janitorial services. The projected annual costs for the hospital library model is given in TABLE XXIX.

B. Major Resource Library's ILL Service to the Model

The interlibrary loan service provided by a major resource library to a community hospital library is no different in kind from the backup service provided to a learning resource center. However, the fact that that library belongs to a consortium suggests that there may be differences in the volume of the ILL requests made to the resource library.

Assumptions

1. The average wait time for ILL requests initiated and filled by fellow consortium members is 2-3 days.
2. The average wait time for filled requests to a major resource library is 5-8 days.
3. The model library borrows through ILL an average of 25 items monthly.
4. Of these requests, 3 are handled by one of the major resource libraries.

Services and Costs

The average full cost per ILL request made to a major resource library ($4.06) is given in TABLE XXVIII. The sum annual cost to the resource library for its ILL service to the model library is therefore 36 times this number (12 mos. @ 3 req/mo), or $146.

PROJECTED ANNUAL COST
FOR
MODEL COMMUNITY HOSPITAL LIBRARY

(1977-1978)

SALARIES & WAGES	
MEDICAL RECORDS SECRETARY (3/4 TIME)	$ 8,250
FRINGE (@ 19%)	1,568
RENT, HEAT, LIGHT, JANITORIAL SERVICES (400 SQ FT.)	2,800
MAINTENANCE - LIBRARY EQUIPMENT	25
EDUCATIONAL COSTS	
MEETINGS, TRAVEL	150
MISCELLANEOUS SUPPLIES	150
MISCELLANEOUS CHARGES	
TELEPHONE	180
PHOTOCOPY	50
POSTAGE	50
ILL SERVICES	25
COLLECTION DEVELOPMENT COSTS	
CURRENT JOURNAL SUBSCRIPTIONS (20 @ $35/ea.)	700
BOOKS (15 @ $30/EA)	450
NEW JOURNAL SUBSCRIPTIONS (@ $35/ea.)	35
A.V. PROGRAMS (BI-ANNUAL PURCHASE)	75
PROJECTED ANNUAL COST	$14,508

TABLE XXIX PROJECTED ANNUAL COST FOR A MODEL COMMUNITY HOSPITAL LIBRARY, 1977-1978

C. Major Influences on the Model's Cost and Operation

TABLE XXIX presents the projected annual cost for a model library given certain assumptions. Another set of assumptions would yield another set of costs. For this reason, it is useful to examine certain aspects of the cost behavior of the model, and to determine the major influences on that behavior. The two types of influences to be considered - decision factors and environmental factors - are those identified by Robinson, Ray and Turk in their paper entitled: "Cost Behavior Analysis for Planning in Higher Education."[17]

One of the major decisions affecting the operation and cost of the model library is the decision to participate in a library consortium. The benefits of such a participation are readily identifiable, and have been given much consideration in the literature. However, the costs of that participation have not been given nearly so extensive a treatment. Some of those costs will be examined here.

Although the model library incurs no membership fee in belonging to a consortium, it nonetheless incurs expense in terms of personnel time, travel costs, telephone bills, and educational activity fees as a result of its membership. These are each real costs to the library, and should be weighed carefully in any consideration of the benefits and costs of consortium membership. The relevant assumptions affecting the model library's participation in the consortium are that the medical records secretary attends four general consortium meetings annually at a nearby metropolitan area, and also that she meets three hours monthly with the union list of serials committee. Finally, she attends the annual workshops sponsored by the consortium. Given these assumptions, the annual direct cost to the library as a result of its consortium membership might be figured as follows:

Personnel -			
	4 annual meetings @ 2 hrs/ea, with 1 hr round trip driving time	12 hrs/yr	
	12 union list meetings @ 3 hrs/ea	36 hrs/yr	
	48 hrs personnel time @ $6.82/hr		$328/yr
Travel -			
	4 50-mile round trips @ $1.25/mile		$250/yr
Telephone - (ILL requests to consortium members)			$50/yr
Workshop fees - 2 @ $10/ea			$20/yr
	SUM ANNUAL DIRECT COST		$648

An annual direct cost for consortium membership of roughly $650 may not seem significant when placed against a total annual cost of $14,508 for that institution. However, that cost does appear quite significant when it is considered that that cost is over 50% of the annual cost allotted for the entire library collection. (See TABLE XXIX).

Environmental factors form the second major influence on the operation and cost of the model library. Perhaps the one factor most directly bearing on the vitality of the consortium concept is the monetary incentives provided by the national and/or regional library networks. The incentives provided by the Midwest Health Science Library Network (MHSLN) might serve to illustrate the potential favorable impact certain external policies can have on the operation of a consortium.

Currently, the first 35 ILL's requested during a single year by an individual institution are funded by the National Library of Medicine and thus are free to that institution. Furthermore, it is the policy of the MHSLN that libraries belonging to a consortium are allowed to pool their free loans and apply them to ILL's requested from major resource libraries. Thus if a consortium has 10 members, that consortium as a group has access to a pool of 350 free ILL requests annually, which can be used to obtain materials from major resource libraries by any member of that consortium. Finally, that pool of 350 free loans is increased by one each time a consortium collectively borrows 200 books, journals, and A.V. programs annually from its own membership, then the initial pool of 350 free ILL's is increased by 200 to 550.

The monetary benefits of such a program are significant. The model library in borrowing 20 items monthly from fellow consortium members in effect contributes $81/month or $974/year (20 ILL's @ $4.06 x 12 mos.) to its consortium, as that consortium now has access to 20 more free loans. Then, by donating its initial 35 free ILL's which the library by itself is entitled to, it contributes an additional $142 annually (35 @ $4.06/ea). Thus the model library, by virtue of its consortium membership, conceivably can initiate 25 ILL's/month or 300/year without incurring any out-of-pocket costs, whereas an autonomous library average 300 ILL's/year would incur an annual ILL services expense of $1076 [(300-35) @ $4.06]

V. Summary and Implications

The goal of providing regional access to medical information can be achieved by employing one of several systems of information delivery. In this paper, two such systems were examined: the regional learning center and the library consortium. In each case, the system was analyzed by means of a model so that the relationship between services and costs might be better understood.

The learning resource center provides an opportunity for local health care personnel and off-campus students to gain better access to medical information. In this respect the learning resource center is much like the community medical library. However, unlike the community hospital library, the learning resource center has another goal, and that is to actively support the ongoing continuing education of the health care provider. To that end, the LRC expands its reference service to include current awareness services such as LATCH, Audio-visual Update, and SDI. It also extends its information searching capability to include online searching of bibliographic databases. Thus the professional's desire to identify and locate medical information is no longer confined to the center's own information resources. Finally, the learning resource center, by means of the resident educator/librarian, extends to its patrons a set of educational support services designed to directly assist the professional in the identification and achievement of specific learning objectives. For nurses and allied health professionals, the center provides Inservice Assistance, a program whereby persons responsible for planning inservice training may get assistance in the identification of the specific personnel needs, the inservice objectives; and the materials available to support the program. Physicians as well as allied health professionals may benefit from the Personalized Learning Plan service in which the professional and the resident educator/librarian together design a learning program to meet the professional's stated objectives. Students in independent study programs can fulfill part of their course requirement through the plan. Services such as these are of some practical interest when considering the continuing education requirements demanded of health care providers.

The cost of sustaining the cluster of services provided by the learning resource center is not insignificant. Consider for example the MEDLINE service. Given the assumptions on which the model learning resource center is based, the annual cost for the MEDLINE online search service is $1250 for the terminal lease, an estimated $900 for connect time (at $15/hr) and an estimated $1640 for telephone hookup charges. If a MEDLINE search requires an average of 20 minutes connect time, then the direct cost per search might be figured as follows:

Resident educator -			
	Annual salary with fringe at 48 wks. at 40 hrs/wk = $9/hr	$17,255	
	Avg. search time at 30 min.		$4.50/search
Connect Time -	Avg. 20 min online at $15/hr		$5.00/search
Telephone charges -	Avg. 20 min at $.46/min		$9.00/search
Offline print -	Avg. 10 pg. at .15/page		$1.50/search
AVERAGE DIRECT COST -			$20.00/search

Thus an average charge to the patron of $20/search would enable the center to recover its direct costs, given the model's assumptions. However, the center still incurs, and has not yet recovered, the indirect annual cost of $1250 for the terminal lease. Thus if the cost per MEDLINE search is refigured to include the appropriate percentage of indirect costs, and for the sake of simplicity it is assumed that the sole indirect cost is the terminal lease charge, then the average full cost per search exceeds the billing fee.

This paper has identified the most important services provided by the learning resource center, and has demonstrated the relationship between various factors and cost levels at the center. Yet the costliness of the MEDLINE service raises several issues critical to this particular service, and to the entire set of services provided by the learning resource center. These issues are: Is there a demand/need for this service? Does the benefit of the service outweigh the cost? Who should/can pay for the service? How much should/can be paid? An identification of the service provided, and an examination of the relationship between various volume and decision factors and the level of costs at the center, are only a first step in the effort to address these complex issues.

Further research into both the measurement of the value and costing of information services would better equip the decision maker to address questions like these, which are of central importance to the purpose, and the operation, of the learning resource center.

The other system of information delivery examined in this paper was the library consortium. The primary objective of the library consortium is to provide better access to medical information by pooling the resources of several libraries. Thus members of a consortium may in practice share a number of services, including interlibrary loan services, MEDLINE services, and the publication of a union list of serials, educational programs, and joint acquisition programs. The costs to the consortium members are often incurred in personnel time, and in miscellaneous supplies and expenses, and occasionally in the assessment of a membership fee.

Ideally consortium enables its members to provide faster ILL services through borrowing materials from local members. Such a sharing of materials may potentially reduce the quantity of the ILL requests made to the major resource libraries, thereby, effectively distributing the responsibility for interlibrary loan service.

Other potential benefits of local cooperation in a consortium are expected to be found in joint acquisition programs. Cooperation in acquisitions it is hoped will both reduce needless duplication of library materials and distribute the costs of acquisition, and acquisition processing responsibilities, to those institutions best equipped for that function.

Studies such as the MHSLN consortium survey taken in 1975 have been most useful in identifying the activities and achievements of this particular system of information delivery. Future research, however, is needed to identify the actual costs of consortium services, and to better substantiate a number of the benefits ascribed to the consortium alternative. It very well may be, for example, that ILL service within some consortia is slower and more costly than if the request had been sent to a resource library, which has the advantage of personnel dedicated to the ILL function, and which houses a considerable supply of medical information.

Another area of future research with respect to the consortium alternative, and one that is of particular relevance to this paper, would be the study of the desirability of establishing a learning resource center within a library consortium. The particular strengths of the learning resource center, that it plays an active role in the ongoing education of the health professional and provides a set of services not commonly found in libraries, suggest that a learning resource center might have much to offer a library consortium. Moreover, the substantial investment required to sustain the high level of service provided by the center, encourages planners to consider not only the potential demand of health care providers in the area immediate to the center, but also the opportunities for service present in the center's surrounding environment. Service to institutions within a library consortium might be one very effective way to increase the utilization of the learning resource center's services.

Section C. Use of a Computer Terminal at a LRC: Some Additional Applications

I. Introduction

Within recent years, much progress has been made in the use of computers to support the processing and delivery of information at libraries. Major work in the development of online integrated data-management systems has been done by libraries, such as Stanford[1] and University of Chicago.[2] Projects utilizing the power of the mini-computer have been initiated at other libraries such as the University of Minnesota Bio-Medical Library.[3] Some systems were originally developed to support the operations of the individual library. Today, the trend in library automation is toward the development of the cooperative computer-based library network. Richard De Gennaro, in his article titled "Library Automation: Changing Patterns and New Directions," comments on the progress made in the past ten years, and suggests that the development of computer networks such as Ohio College Library Consortium (OCLC) points to a "new maturity"[4] in library automation.

Small libraries, though lacking the resources to develop large scale computer-based information systems such as these, may still gain access to their power through relatively inexpensive computer terminals. This section examines several new opportunities available to a learning resource center that is equipped with a terminal.

II. A Learning Resource Center Model with Terminal Hookup to a Minicomputer

The utilization of a minicomputer system to support a range of library functions and services is currently under development at the University of Minnesota Bio-Medical Library. The objective of the minicomputer system is to provide online support for the cataloging, acquisitions, serials, accounting, reference retrieval, and circulation functions at Bio-Medical Library through the development of an integrated library data management system. The potential impact of such a system can be seen in terms of the new ways traditional library functions are to be performed. Online bibliographic data records can be searched by library personnel for up-to-date information as to an item's in-process status, its full bibliographic description, and its current location. The traditional primary access points to the bibliographic index of subject, title, and author will be extended under the minicomputer system to include series, call number, and keyword searches. These primary access points, along with secondary access points of date and type of material will enable the reference librarian to retrieve information about the location and status of desired materials through a variety of access combinations. The online bibliographic record will also facilitate the collection of various kinds of accounting and statistical data such as user billing information, circulation patterns, and the length of time taken to process materials. Information of this kind will be collected and analyzed for the purpose of generating management reports on internal operations and the current status of various accounts. Such a system, in addition to directly benefiting Bio-Medical Library, can also provide a unique opportunity for regional learning resource centers in the form of new or improved services to its patrons.

There are several new services available to a learning resource center that has a terminal access to a minicomputer system, such as that being developed by Bio-Medical Library. Of these new services, the two primary ones are online catalog reference retrieval and online initiation of interlibrary loan requests.

A catalog of holdings maintained online means that files of bibliographic information identifying serials, monographs, and audio-visual materials are stored on auxiliary computer storage devices such as discs and drums, instead of on cards in a catalog. Thus the learning resource center model constructed in the previous section, because it is equipped with a computer terminal, may gain access to those files when a request is entered at the terminal and transmitted over telephone line to the minicomputer system. An example may serve to illustrate how the system would work.

If a patron at the learning resource center requests a particular title from the Bio-Medical Library collection, the searcher enters the identifying information into the terminal using any combination of several access points. Then, if the title is positively identified, the standard bibliographic record will either be printed at the terminal or flashed on a screen in the case of a CRT terminal. In addition, a status indicator would appear specifying the availability of the material, that is, indicating first whether the material is in the collection, and then whether it is checked out, lost, at the bindery, or available for use. Then, to receive an item, either a book, audio-visual program, or a photocopy, through interlibrary loan, the searcher need only enter any specific instruction such as page numbers to be photocopied, and the command: "Send" and the ILL request is initiated.

The advantages of ILL requests thus initiated are that the patron receives immediate feedback as to an item's availability and that days in mailing time are saved. Online ILL requests also save the interlibrary loan department the time-consuming task of processing unverified, or inaccurate, or incomplete ILL requests.

In a subject search, the online interaction is similar to that of any online bibliographic search. Thus if a learning resource center is equipped with a CRT terminal with printing capability, the searcher has the option of requesting to view the result titles on the CRT screen or to have them printed. In many instances a screen viewing is preferable to printing because the searcher may select much more rapidly from titles flashed on a screen. Then to print a selection of those titles, the searcher need only enter the appropriate request and a hard copy is printed.

The learning resource center with a terminal access to a minicomputer system has certain other services also available to it. The resident educator/librarian may regularly request to scan the acquisitions file to find out new title and pricing information. The resident education/librarian also would have easy access to standard catalog data for all materials in the online catalog collection. Finally, the system could conceivably maintain an online union list of holdings for various libraries in the state.

	DIRECT VARIABLE COST	DIRECT FIXED COST
RESIDENT EDUCATOR/LIBRARIAN ($8.17/hr @ 15 min/search)	---	$2.03
CRT-TERMINAL LEASE (@ 10 min online/search) (100 online hrs/yr @ yrly lease of $2050 = $20.50/online hr)	---	$3.42
CONNECT TIME CHARGES (10 online min @ $7/online hour)	$1.15	---
TELEPONE CHARGES (10 min/search @ $.46/min)	$4.60	---
COLUMN TOTALS: VARIABLE/FIXED	$5.75	$5.45

TOTAL DIRECT COST = VARIABLE + FIXED

$11.20 = $5.75 + $5.45

TABLE XXX — AVG. TOTAL DIRECT COST PER ONLINE CATALOG SEARCH BY LRC MODEL. -1977 COSTS

A learning resource center provides a cluster of services to support the education of students and the continuing education of health professionals. The center that is equipped with a terminal access to a minicomputer system can provide faster, more reliable interlibrary loans, expand its reference retrieval, and gain access to various auxiliary services. The end result for such a center is a higher quality of patron service.

The two primary costs to be determined for the learning resource center model are the cost of online catalog reference retrieval and the cost of online initiation of interlibrary loan requests. In order to determine these costs, certain assumptions must be made about the average length of time to make a request and the annual volume of online service used. The assumptions on which the online costs are based are as follows:

1. The average online reference retrieval time required to search and locate desired material in the online catalog is 10 minutes.
2. The learning resource center performs one online catalog search daily, yielding an annual total of 260.
3. The center leases one terminal, a CRT terminal with printing capability. The annual leasing charge is $2050.
4. The total annual online hours used for all computer bibliographic searches of the online catalog, commercial databases, and NLM databases is 100 hours.

TABLE XXX displays the direct costs per online catalog search made at the learning resource center model. Suprisingly, the major portion of the variable direct cost, and in fact the highest single component of the total direct cost, is the long-distance telephone charges. The total fixed cost per search of $5.45 only slightly exceeds the telephone bill. This fixed cost represents the cost the center incurs simply in order to provide the capability for this service. Because fixed costs do not vary with volume, they are incurred whether or not the service is used. Thus a decision to lease a CRT terminal with printing capability should not be made without careful consideration of the expected demand for the terminal's use. As the annual volume of online hours increases, the allocated portion of the leasing costs per online catalog search will therefore decrease, as will the direct cost per unit service. Another factor to be considered before making that decision is the relative advantages of leasing versus buying a computer terminal. A terminal that leases for $2050 annually could probably be purchased for about $3000.

The projected direct cost to send an interlibrary loan by terminal is given in TABLE XXXI. Here again, the highest element of the total direct cost is the long-distance telephone charge, in this case accounting for nearly 75% of the total direct cost. For this reason, the actual direct cost of an ILL request initiated at the conclusion of an online catalog search is significantly cheaper than the projected ILL direct cost given here. The cost for sending those ILL requests is buried in the online catalog searching costs, but perhaps may be on the average as little as 25¢.

	TOTAL DIRECT COST
RESIDENT EDUCATOR/LIBRARIAN	
($8.17/hr @ 2 min)	$.14
CRT-TERMINAL LEASE	
($20.50/online hour @ 10 sec online	$.06
CONNECT TIME CHARGES	
(10 sec online @ $7/online hr)	$.02
TELEPHONE CHARGES	
(CHARGE FOR 1ST MIN, TAX. INCL.)	$.62
SUM	$.84

TABLE XXXI — AVG. DIRECT COST TO THE LRC TO SEND ONE ONLINE ILL REQUEST -1977 COSTS

Two of the more significant financial decisions to be made with respect to online bibliographic services are the initial decision to provide the service, and the decision to lease or buy the computer terminal. However, once a decision has been made to provide access to a computer resource, then the additional cost of using that resource for any kind of computer-based service becomes the only relevant cost with respect to providing, or not providing, that service. Thus in the case of a decision as to whether or not to provide online catalog searches, the only relevant direct cost is the $5.45 charge for online and telephone time.

III. Computer-Assisted-Instruction at a Learning Resource Center

Computer-assisted-instruction (CAI) is a term used to describe a mode of instruction whereby the student learns by interacting with a computer terminal, instead of a teacher. The instructional material is already packaged for the student in a computer program, and stored in a computer library. The student therefore has only to enter into the terminal a request for the desired material, and then a message sent over telephone wires to the computer system where the program is stored will cause it to be made available for online interaction. Transmission of such a message might in some instances require the services of a minicomputer to relay the message on to its destination. However, in most cases, the message initiated at the learning resource center could be sent directly to the desired computer system.

The use of a computer terminal for computer-assisted-instruction is particularly suited to a learning resource center, whose broad objective is to support the continuing education of health professionals. Use of the terminal for CAI provides four distinct benefits to the patron and to the center. The patron has the opportunity to select instruction material to suit his own interests and needs. Secondly, he is provided with programmed assistance in the evaluation of his progress in the instruction. Thirdly, the center can provide educational assistance to one patron while at the same time freeing the resident educator to help others. Finally, CAI makes good sense economically. Once a terminal has been acquired, the additional cost of providing CAI is relatively reasonable.

The several modes of instruction possible in CAI are described by R.A. Seltzer in "Computer-Assisted-Instruction -- What It Can and Cannot Do."[5] The drill and practice mode enables the student to develop a pre-determined level of proficiency in a particular set of skills. A common application in this mode would be instruction in medical terminology. The tutorial mode provides instruction in a particular area by presenting the material, and then asking the student questions about it. The student then may choose to have his answers evaluated by the computer program. In addition, the logical structure of the program allows the student to progress at his own speed, to repeat the presentation of a difficult piece, or to move ahead to more challenging material. In each case, the student is provided with immediate feedback as to his progress and level of mastery.

Perhaps the most intriguing application of CAI is found in the use of the problem solving mode. In this mode, the student is presented with a problem. He then must identify the steps he would take to solve the problem and enter that information into the terminal. The computer executes his recommended strategy and provides him with the outcome of his decision. A good application of this mode can be found in clinical decision making. The student, when presented with a case history of a patient, must then through questioning elicit the pertinent facts and recommend a treatment. The program will then execute the recommended solution and feedback a probable outcome of the treatment.

The problem solving mode could be of particular benefit to medical students and to physicians lacking experience in the treatment of particular diseases. Because of its problem solving character, this mode of instruction requires the student to use his knowledge and experience in the recommendation of the treatment. Thus the student is challenged to acquire a high level of mastery.

The table below presents the projected marginal direct cost to the center per computer-assisted-instruction. Because it is assumed that a terminal has already been acquired, the only relevant direct costs are the additional telephone and online charges per instruction.

MARGINAL DIRECT COST PER CAI (@ 30 min/instruction)	
TELEPHONE CHARGES ($.45/min @ 30 min)	$13.60
ONLINE CHARGES ($10/hour @ 30 min)	5.00
TOTAL MARGINAL DIRECT COST TO THE LRC PER CAI	$18.60

IV. Summary and Implications

A learning resource center provides the health professional with a cluster of services ranging from reference retrieval to guidance in the development of personalized learning plans. The use of a computer terminal linked to a minicomputer system can in various ways extend and enhance the quality of service at the center. Online bibliographic searches provide the patron with an extensive list of the titles treating a subject of interest. Computer-assisted-instruction offers the patron the opportunity to complete programs of instruction in numerous clinical and related areas. A terminal hookup to the minicomputer system also allows the center to supplement its existing set of services with online catalog reference retrieval, online initiation of interlibrary loans, acquisitions file searches, catalog identification data retrievals, and others.

The use of technology to support the processing and information delivery functions of libraries extends beyond the applications discussed here. Document delivery can now be accomplished through the use of facsimili devices that copy and then transmit an electronic message over telephone wires to a remote station where a reproduction of the original is then produced. One type of facsimili system uses a printer at the remote station to produce printed material. Another system, telecopier facsimili transmission, employs a copier at the remote point, and thus can reproduce either pictures, or printed matter. Currently, the purchase price for a telecopier facsimili transceiver ranges from $1550 to $2850, with one sophisticated model costing $8500. The length of time necessary to transmit the information by telecopier, irrespective of geographical distance, is 2-6 minutes, depending on the unit.

Advances have also been made in the development of devices to transmit audio-visual material. Researchers at Westinghouse Electric Corporation have developed and tested a system to transmit audio-visual information via conventional television systems.[6] The system, called VIDAC (video audio compressed) utilizes a device called a program converter that transforms the initial A.V. sequence into a compressed audio and video format. Transmission over television network can be accomplished once the program is played on a tape recorder. A color television monitor at a remote location acts as the receiving end of the transmission, and displays the audio-visual program.

The most sophisticated means for the transmission of facsimili information employs the use of satellite networks, instead of telephone or television communication networks. Edelson and Wilson reported at the 1972 annual ASIS meeting on the use of satellite communications for information processing.[7] The authors traced the development of the International Telecommunications Satellite Consortium (INTESAT), an organization consisting of 83 nations, and operating a global communications network connecting satellites on six continents. The authors concluded that the satellite system "provides an existing basis for an international information network," a system that can be used to transmit "digital data...with a high degree of error control, high speed, high resolution facsimili, voice, and even television."[8]

These and other developments in the area of telecommunications systems will doubtless have an impact on the ways in which libaries process and deliver information. The extent to which such information networks become economically accessible to smaller information centers, such as learning resource centers, can only be surmised. It does seem likely, though, that learning resource centers will gain access to such sophisticated communications networks through local, computer-based library information systems such as those under development at Bio-Medical Library and other major libraries.

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used by the National Library of Medicine for Indexing Index Medicus.
The vocabulary also is used for searching MEDLINE.

12. MEDLINE (MEDLARS On-Line) is the National Library of Medicine's computer-based information retrieval system of the Index Medicus, International
Nursing Index and Index to Dental Literature.

13. Formulation refers to the process wherein the search analyst selects the
appropriate subject terms, combines those terms according to
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Size of hospital	100-300 beds[A]	50-100 beds[B]	200-400 beds[C]
Book collection	300 titles	100 titles	300 titles
Annual book additions	50 titles	20 titles	50 titles
Current journal subscript.	35 journals	20 journals	60 journals
Seating capacity	10 seats	10 seats	10% total hosp. staff

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Size of hospital	100-300 beds[A]	50-100 beds[B]	up to 200 beds[C]
Book Collection	300 titles	100 titles	100 titles
Annual book additions	50 titles	20 titles	30 titles
Current journal subscript.	35 journals	20 journals	40 journals
Seating capacity	10 setas	10 seats	10% of hosp. staff

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APPENDIX 1

University of Minnesota (Minneapolis) Health Science Program providing rural clinical education, 1976-1977 school year.

1. Medical School: Rural Physician Associate Program.

Thirty family practice students and ten Internal Medicine students participated in the RPAP for 9-12 months. Physicians from the following communities served as preceptors: Madelia, Long Prairie, Cloquet, New Ulm, Montevideo, Windom, Little Falls, LaCrosse, Fergus Falls, Alexandria, Wabasha, Benson, Granite Falls, Aitkin, Forest Lake, LeSueur, Redwood Falls, Willmar, Park Rapids, Austin, Grand Marais, Blue Earth, Watertown, Pine River, Fairmont, Parkers Prairie, Preston, St. Peter, Jackson, Mankato, Brainerd, Waconia, Mound, Hibbing, Worthington, Wiona, and Willmar.

2. School of Pharmacy: Rural Pharmacist Program.

This externship places pharmacy students in a retail or hospital pharmacy for one quarter. During this past year, seven of the students studied in a rural community, usually in a retail pharmacy.

3. School of Dentistry: Health Ecology.

Seventeen dentistry students participated in the Health Ecology program for elective credits. Students have completed their third year clinics before assignment to preceptors in the rural area. Locations selected for off-campus study included Crookston, Cook, Virginia, Two Harbors, Wadena, Brainerd, Fergus Falls, Elbow Lake, Chaska and three South Dakota towns. The program has been popular and successful. Health Ecology had more requests from rural preceptors than students available for the positions. Sixty percent of the dental students have decided to practice in the rual community where they studied. The program is funded by AHEC.

4. Public Health Nursing: HE Certificate Program.

Each year two different areas are selected for the programs. Although Rochester and Duluth have been selected, smaller cities such as Brainerd and Alexandria also are used. The program for approximately 34 students lasts nine months.

Public Health Nursing: Pediatric Nurse Associate Program.

During the past year, eight students have studied for nine months in Fergus Falls as participants in the Pediatric Nurse Program.

5. School of Nursing.

The School of Nursing does not have students in rural Minnesota, but several of the six independent study students were located in rural North Carolina. The School of Nursing is planning an external degree program which will involve a number of students in rural areas.

6. Hospital and Health Care Administration

The Office of Continuing Hospital and Health Care Education provides a number of independent study programs: Independent Study Program in Patient Care Administration, Independent Study Program in Long-term Care Administration, Supervisory Training Program and Independent Study Program for Health Care Trustees. Students in these programs are registered University of Minnesota students. All programs utilize a multimethod approach but most require the study to be "in-residence" on campus for a specified time. The largest program, Independent Study Program for Hospital and Health Care Facility Administrators, is a 3 year study program requiring a thesis. Students may apply the 55 credits earned towards a master's degree. The number of students from rural Minnesota communities varies from year to year out, according to a spokesman from the Office; the number is significant for each of the programs.

7. Continuing Education.

The University of Minnesota provides and sponsors numerous continuing education programs for health professionals. Although beyond the scope of the present study, the information needs of these adult learners will have an impact on University and community library resources. This is an area requiring future study and evaluation.

APPENDIX 2

A Brief Review of Bio-Medical Library's State-Wide Library Activities

Information needs of University of Minnesota students in non-urban areas can be viewed in isolation. The quality and quantity of information services for the rual health professional become that of the University student. All past library efforts - both the successes and the failures -- are the legacy inherited by students who elect study off-campus. As a state institution, the Bio-Medical Library always has provided some information services, such as Interlibrary Loan of library materials, to health professionals throughout the state; but only within the last decade have efforts been made to publicize services, equalize information access, formalize procedures and encourage library development for the non-urban health professional. The Bio-Medical Library's leadership in these activities received impetus through its participation in Regional Medical Program, Regional Medical Library Program, and Area Health Education Centers.

The DeBakey Commission, recommending "A National Program to Conquer Heart Disease, Cancer and Stroke" led to the establishment of Regional Medical Programs (RMP) under Public Law 89-239 (1965, 89th Congress). In 1970, Minnesota's Northlands Regional Medical Program initiated a library component with the long range goal of developing a biomedical library network for the state. In keeping with Northland RMP philosophy, the RMP liaison librarian accepted as a priority the establishment and development of effective non-metropolitan library services relevant to local needs.[1] The librarian's grass-roots approach took her to 130 different localities advocating library development. To assist the RMP liaison librarian, extension librarians were employed at the Bio-Medical Library and Mayo Clinic Library. They provided information services[2] and assisted the RMP librarian in the following activities: consultation to hospital libraries, loan of core collections, library workshops, apprenticeship training for library managers, assistance in grant applications, publication of Biomedical Serials, 1972 and MEDLINE Search Services.[3]

In an evaluation of the RMP library services in Minnesota,[4] Sodergren presents a rather negative interpretation but she does concede that RMP made a "significant contribution toward raising the visibility of medical libraries within the total health care delivery system."[5] The negative evaluation is refuted, in part, by Lorrig who demonstrate higher use statistics for library services[6] and by Wulff who questions generalization from a small non-random survey.[7] The response of health professionals during this relatively short period might well be interpreted as a demonstration of need. Sodergren suggests that a "certain foundation may have been laid through the core library program especially."[8] Certainly a beginning had been made, and the impact of RMP library services did not end with its demise in 1972. The RMP stimulated an interest in library services among non-metropolitan health professionals. Furthermore, the RMP provided the Bio-Medical Library an opportunity for exploring its role in the development of medical information services throughout the state.

The RMP were not the only federally financed program providing medical library services, nor was it the oldest or the most extensive. In 1965, Congress enacted the Medical Library Assistance Act (MLAA) (PL 89-291) thus making available to health science libraries competitive grants and contracts from the National Library of Medicine (NLM). Projects funded through the MLAA and its subsequent renewals have included: (1) construction of facilities, (2) training in medical library sciences, (3) special scientific projects, (4) research and development in medical library science and related fields, (5) improvement and expansion of the basic resources of medicine libraries, (6) establishment of regional medical libraries, (7) biomedical publications and (8) regional branches of the NLM.[9]

One of the programs, the Regional Medical Library Programs (RMLP), is a component of the national Biomedical Communications Network.[10 4] Although the resource grants have stimulated library development, the RMLP has had, and continues to have, the greatest impact on medical library activities. Much as been written about the RMLP - both for the librarian[12-17] and for the health professional.[18-19] The RMLP is "designed to provide a logical basis for extended cooperation between existing institutions in support of their fundamental constituencies by making available to each the library resources of the nation."[20] To achieve the desired information transfer to support health services delivery, education, and research, a hierarchial system was designed with each higher level facility acting as a backup resource to the echelon below. Levels in the network are: (1) the basic unit, usually a community hospital library; (2) the resource library, usually a medical school library; (3) the Regional Medical Library; and (4) the National Library of Medicine.[21]

The NLM designated eleven Regional Medical Libraries throughout the country (see Appendix A). Along with five other states Minnesota belongs to Region VII the Midwest Health Science Library Network (MHSLN) (formally called Midwest Regional Medical Library). When the Midwest Regional Medical Library decentralized in 1973 to become MHSLN, grant funds were obtained to support a coordinator position for each of the six states in the region. For Bio-Medical Library, the funding was fortuitous. With the RMP library services ending in 1972, the Coordinator could assume responsibility for health science library activities after a relatively short hiatus. The timing also eliminated some of the duplication between RMP and RML activities occuring in other states.[22]

In an excellent article by Holtum, McKloskey, and Mahan, the role of the coordinator in the health science library network is explored.[23] The authors describe three major roles for the coordinator: communicator, initiator, and resource/consultant. Among the numerous activities involving the coordinator, the following are exemplitory: (1) publicizes state and network programs, (2) acts as a clearinghouse for information on health science libraries in the state, (3) assists with preparation of resource grant applications, (4) promotes consortia formation and development, (5) identifies needed library services, (6) evaluates services, and (7) participates in the program planning model.[24] The nature of the Coordinator's position "is one of facilitation and integration"... with special emphasis placed on "establishing a firm and self-sufficient footing for programs and services.[25]

As one of the Resource Libraries in the state, the Bio-Medical Library makes its collections and services available to all Basic Unit libraries in Minnesota. The Bio-Medical Library fills interlibrary loan requests to other Resource Libraries in the MHSLN Region or to the NLM, participates in

Union Lists of Serials, provides MEDLINE searches, loans audiovisual materials, and provides some backup reference service. With an office in Bio-Medical Library the Coordinator can readily communicate problems requiring technical assistance to librarians specializing in such areas.[26] Staff at the Bio-Medical Library benefit from an "inhouse" expert on Regional policies and planning.

McKloskey notes that one of the "hallmarks of the MHSLN is the large number of consortia of health science libraries."[27] The Coordinator stimulates the development of consortia and provides advice as needed. A list of Minnesota consortia is appended (Appendix B). Development of consortia has considerable impact on health science library activities in the state. Before the consortia formed many hospital libraries routinelly used Bio-Medical Library or one of the other Resource Libraries [28] as their source for even the most primary of information needs. Librarians questioned this method for obtaining information. Some of the library activities appeared to be working at cross purposes. While urging local hospital library development, the methods provided and encouraged those same libraries to use the Resource Library as a primary information source. Local resources remained inadequate or inefficiently used. Development of new consortia or the formalization of informal networks into working consortia moved the Basic Unit into central position. Bio-Medical Library then could function as a back-up resource, the role specified in the National Library of Medicine's library network. More importantly, health professionals access to information improved as the Basic Units within the consortia developed and channels for backup service were formalized.

A major goal of the Regional Medical Library Program is to provide health professionals access to health science information. In Minnesota the network is operational with many actively participating health science libraries. But, as McKloskey points out, a considerable number of Minnesota hospitals have inadequate libraries or none at all.[29] In effect, such hospitals are outside the RML network. To expand the availability of the RML, there is a growing interest in joining the Area Health Education Center programs to the RML.

In a special report on Higher Education and the Nation's Health (1970), the Carnegie Commission on Higher Education recommended the establishment of Area Health Education Centers (AHECs). Serving as satellites to University health science centers, the function of the AHECs would be as following:

1. To maintain a community hospital of outstanding quality...

2. To conduct educational programs under the supervision of the faculty of the university health science center with which the center is affiliated.

3. To have these educational programs include -

    a. residency programs
    b. clinical instruction for M.D. candidates and D.D.S. candidates...
    c. clinical experience for students in allied health programs
    d. continuing education programs for health manpower in the area...

4. To provide guidance to comprehensive colleges and community colleges in the area in the development of training programs for allied health professionals.

5. To cooperate with hospitals and community agencies in the planning and development of more effective health care delivery systems.

6. To conduct limited research programs concerned primarily with the evaluation of health care delivery systems.[30]

A number of authors have explored the intent or purpose of the AHECs or have described AHEC programs.[31-35] Several authors have discussed the relationship between libraries or the biomedical communication network and the AHECs.[36-39] Directory information also is available.[40-41]

In Minnesota AHEC has not established centers which serve as a network for biomedical communication, nor has the Bio-Medical Library initiated specific procedures for providing information or library support of AHEC programs. With decentralized health science education and continuing education programs in local areas increasing, the Bio-Medical Library is exploring possible methods for education support services.

The University of Minnesota Health Sciences and the Bio-Medical Library have developed and tested models for the delivery of information services. LearningResource Centers (LRC) were established at two regional sites - one in a hospital setting managed by a medical librarian and one in an educational institution with the LRC managed by a health educator. Evaluation of these early models suggests that the college based LRC was less successful than its hospital-based counterpart. Physicians and hospital personnel found the college-based LRC inconvenient geographically. Availability of the LRC did not match the hospital staff work patterns. The evaluation also indicated that a medical librarian is the appropriate professional to manage the LRC. Information retrieval abilities, reference knowledge, collection development, acquisition and classification skills are essential. The ability to access the often complex and confusing network arrangements is mandatory if a regional LRC is to fulfill ts service potential.[42]

Evaluation results suggest the following characteristics for a regional LRC:

1. Established in hospital settings

2. Provide the services of a medical librarian/education

3. Provide primary level library services for both hard copy and mediated educational materials

4. Maintain audio-visual hardware for viewing programs

5. Distribute mediated educational programs on a limited regional basis

6. Assist students and practitioners in determining their educational needs and in supplying appropriate materials to meet these needs.

7. Provide training and service in the principles and functions of individualized education[43]

A fuller description of the hospital-based Learning Resource Center is appropriate because (1) it was established with financial support from Minnesota AHEC, (2) it has an administrative relationship to Bio-Medical Library and (3) it has continued to grow and develop.

The Learning Resource Center at Lake Region Hospital in Fergus Falls, Minnesota was established in 1974 through funding from Minnesota AHEC. At the same time, the Lake Region Hospital Library was upgraded. The Library is supported through the hospital budget. Personnel for the Hospital Library includes one half-time medical librarian[44] and one half-time equivalent of work-study student help for clerical duties. The LRC is staffed by one-half time medical librarian/Resident educator and one-half time Resource Clerk. The one librarian who fills these two half-time positions has a Hospital Library Committee and an Advisory Board for the LRC.

The LRC and Library serve the geographic area within a 50 mile radius. This seven county area includes 16 hospitals with bed size ranging from 15 to 150, the State Hospital with 500 beds, and 31 nursing homes. In addition, service is available to local medical clinics, such as the Fergus Falls Clinic and to health agencies and service organizations, such as the Lakeland Mental Health Center,the Otter Tail County Public Health Nursing Service, and the Lake Park-Wild Rice Children's Home. Within the 7 county area there are only 6 established hospital libraries of varying quality. The Lake Region Hospital is a 150-bed hospital with staff of 365, 200 of which are nurses. There are 35 physicians on the medical staff.

Services provided through the Hospital Library include manual literature searches, reference services, MEDLINE access services, SDI (Selective Dissemination of Information) for current awareness purposes, LATCH[45] and interlibrary loans. Services provided through the LRC Center include Audiovisual Resource searches, Update Service to alert users to new audiovisuals available for viewing, inservice assistance, and Personalized Learning Plans. For in-service assistance, the librarian/educator and the client work together identifying objectives of the in-service program, the learning needs of the in-service program participants, and the materials needed to support the in-service program. A Personalized Learning Plan is a tool for assisting health care practitioners to systematically plan for the fullfillment of their educational needs and interests. The librarian/resident educator assist the client in each step of the plan: identifying needs, writing objectives, locating resource materials, scheduling material use, and planning for evaluation.[46]

Service levels at the LRC and Library are high. An average of 175 persons view approximately 27 audiovisual programs each month. Seventy percent of those viewing are nursing personnel, 10% are physicians, and 20% other health personnel. In January 1976, 53 clients viewed LRC programs; in January 1977, the number had increased to 219. Each month three clients seek in-service assistance, and five health professionals take advantage of the Personalized Learning Plan Services. Each month, the librarian performs 15 manual literature searches, interviews 4 clients for MEDLINE searches, and answers numerous reference requests. LATCH is requested about 6 times a year and 8 SDI searches are done monthly. Each month 90 interlibrary loan requests are forwarded to consortia members or to a Resource Library. This may be compared to fiscal year 1974/75 when 16 interlibrary loans per month were processed. The library collection is non-circulating, but based on reshelving the librarian estimated 500 books and journals are used each month, with 35% being books and 65% journals. The hospital library has 62 current subscriptions of journals and 400 books in the library. In addition, approximately 150 books are located in various hospital stations. Four indexes are available.[47]

In April, 1977 a hospital library investigative committee surveyed the hospital employees and the medical staff to determine library use. They found that 10-15% of the hospital employees use the library and its services, while 5-7% use the LRC. Approximately 60% of the physicians use the hospital library but less than 50% have used the LRC. When asked about funding, approximately 50% of the medical staff stated that they would be willing to provide financial support for the hospital library.[48]

The librarian estimates that 60% of the hospital library users are physicians with all other health professionals making up the other 40%. But the LRC user population is made up of 70% nurses, 20% other health personnel and 10% physicians. Students studying at Lake Region Hospital use both the library and LRC extensively. During the past year the following University students were library clients: 4 Pharm D students, 2 Rural Physician Associate Program Students, 2 long-term care administration students. The 2 RPAP preceptors were library users as well as 1 physical therapy student from a 4 year college. Students and instructors from the allied health fields at the Fergus Falls Community College also are frequent clients.[49]

Although Bio-Medical Library's participation in the function of the Regional LRC is one of back-up services and administrative assistance and planning, the success of this LRC points a direction for future information services planning.

The Bio-Medical Library has been and continues to be active in the planning and provision of information services to the state.

Regional Medical Libraries

Regional Medical Libraries

Regional Library	Area Served	Name and Address of Library
1. New England	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	Francis A. Countway Library of Medicine 10 Shattuck St Boston, MA 02115
2. New York and northern New Jersey	New York and the 11 northern counties of New Jersey	New York Academy of Medicine Library 2 E 103 St New York, NY 10029
3. Mid-Eastern	Pennsylvania, Delaware, and the 10 southern counties of New Jersey	Library of the College of Physicians 19 S 22 St Philadelphia, PA 19103
4. Mid-Atlantic	Virginia, West Virginia, Maryland, District of Columbia, North Carolina	National Library of Medicine 8600 Rockville Pike Bethesda, MD 20014
5. East Central	Kentucky, Michigan, Ohio	Wayne State University Medical Library 4325 Brush St Detroit, MI 48201
6. Southeastern	Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee, Puerto Rico	A. W. Calhoun Medical Library Emory University Atlanta, GA 30322
7. Midwest	Illinois, Indiana, Minnesota, North Dakota, Wisconsin	John Crerar Library 35 W 33 St Chicago, IL 60616
8. Midcontinental	Colorado, Kansas, Missouri, Nebraska, South Dakota, Utah, Wyoming	University of Nebraska Medical Center 42nd St and Dewey Ave Omaha, NB 68105
9. South Central	Arkansas, Louisiana, New Mexico, Oklahoma, Texas	University of Texas Southwestern Medical School at Dallas 5323 Harry Hines Blvd Dallas, TX 75235
10. Pacific Northwest	Alaska, Idaho, Montana, Oregon, Washington	University of Washington Health Sciences Library Seattle, WA 98105
11. Pacific Southwest	Arizona, California, Hawaii, Nevada	Center for the Health Sciences University of California Los Angeles, CA 90024

MINNESOTA HEALTH SCIENCE LIBRARY CONSORTIA[50]

Arrowhead Professional Libraries Association (17 members)
College of St. Scholastica, Duluth
Community Memorial Hospital, Cloquet
Douglas County Receiving Center, Superior
Duluth Family Practice Center, Duluth
Duluth Receiving Center, Duluth
Hibbing General Hospital, Hibbing
Human Development Center, Duluth
Mercy Hospital, Moose Lake
Miller-Dwan Hospital and Medical Center, Duluth
Nat. G. Polinsky Rehabilitation Center, Duluth
St. Louis County Health Department, Duluth
St. Luke's Hospital, Duluth
St. Mary's Hospital, Duluth
U.S. Environmental Protection Agency, Duluth
Virginia Municipal Hospital, Virginia
Douglas County Health Care Facility, Wentworth, Wisc.
Superior Memorial Hospital, Superior, Wisc.

Medi-Sota Library Consortium (6 members)
Appleton Municipal Hospital & C & NC Unit, Appleton
Canby Community Hospital & Senior Haven, Canby
Chippewa County-Montevideo Hospital, Montevideo
Johnson Memorial Hospital, Dawson
Madison Hospital Association, Madison
Ortonville Municipal Hospital, Ortonville

Minnesota Department of Public Welfare (12 members)
Anoka State Hospital, Anoka
Brainerd State Hospital, Brainerd
Cambridge State Hospital, Cambridge
Department of Public Welfare, Centennial Office Building, St. Paul
Faribault State Hospital, Faribault
Fergus Falls State Hospital, Fergus Falls
Glen Lake State Sanatorium, Minnetonka
Hastings State Hospital, Hastings
Moose Lake State Hospital, Moose Lake
Rochester State Hospital, Rochester
St. Peter State Hospital, St. Peter
Willmar State Hospital, Willmar

2

Twin Cities Biomedical Consortium (29 members)

Abbott-Northwestern Hospital, Minneapolis
American Medical Systems, Minneapolis
Bethesda Lutheran Hospital, St. Paul
Boeckmann Library, Ramsey County Medical Society and United Hospitals, St. Paul
Children's Hospital, St. Paul
Divine Redeemer Hospital, St. Paul
Fairview Hospital, Minneapolis
Fairview-Southdale Hospital, Minneapolis
Golden Valley Health Center, Golden Valley
Group Health Plan, Inc., St. Paul
Hennepin County Medical Center, Minneapolis
Lutheran Deaconess Hospital, Minneapolis
Medtronic, Inc., Minneapolis
Mercy Hospital, Coon Rapids
Methodist Hospital, Minneapolis
Minnesota Department of Health Library, Minneapolis
Mounds-Midway School of Nursing, St. Paul
Mounds Park Hospital, St. Paul
Mount Sinai Hospital, Minneapolis
North Memorial Medical Center, Minneapolis
St. John's Hospital, St. Paul
St. Joseph's Hospital, St. Paul
St. Louis Park Medical Center, Minneapolis
St. Mary's Hospital, Minneapolis
St. Mary's Junior College, Minneapolis
St. Paul Ramsey Hospital, St. Paul
Unity Hospital, Fridley
VA Hospital, Minneapolis

Hazelden Foundation, Center City, MN

Valley Medical Network (5 Minnesota hospitals)

Dakota Clinic, Fargo
Douglas County Hospital, Alexandria, MN
Fargo Public Library, Fargo
Lake Region Hospital, Fergus Falls, MN
Neuropsychiatric Institute, Fargo
North Dakota State Hospital, Jamestown
North Dakota State University (associate member)
St. Ansgar Hospital, Moorhead, MN
St. Francis Hospital, Breckenridge, MN
St. John's Hospital, Fargo
St. Luke's Hospital, Fargo
VA Hospital, Fargo
Wheaton Community Hospital, Wheaton, MN

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24. Ibid., p. 225.

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44. A medical librarian may be defined as a professional with a Masters degree in Library Science from an American Library Association accredited program. The librarian has received special course work in medical librarianship and is certified by the Medical Library Association.

45. LATCH (Literature Attached Charts)
When an unusual disease or patient problem is encountered by a member of the patient care team, information is located and placed on the patient's chart. Thus all health personnel helping the patient have immediate access to pertinent information. For another example of LATCH use, see:
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APPENDIX 3

Questionnaire for RPAP Students

I. Bio-Medical Library Services

Please rate the following aspects of the Bio-Medical Library Services provided to you while studying off-campus by circling the most appropriate response. If you did not use Bio-Medical Library service, check here ☐ and go on to number II.

	Excellent	Good	Adequate	Unsatisfactory	Very unsatisfactory	
1. The amount of material (or number of journal articles)?	E	G	A	U	V	(1)
2. The relevance of material?	E	G	A	U	V	(2)
3. The currency of material?	E	G	A	U	V	(3)
4. The MEDLINE (computer-produced) bibliography?	E	G	A	U	V	(4)
5. The turn-around time (did you receive information in time)?	E	G	A	U	V	(5)
6. The attitude of the Bio-Medical Library staff?	E	G	A	U	V	(6)

Any comments on Bio-Medical Library Services?

____

____

____

____

II. Purpose for Information Need

How often did you need information services for the following purposes: (circle the appropriate response).

	Very Often	Often	Sometimes	Rarely	Never	
1. For patient related problems?	V	O	S	R	N	(7)
a. to increase your knowledge of a diagnosed patient condition?	V	O	S	R	N	(8)
b. to explore possible atlernative diagnosis, treatment, etc.?	V	O	S	R	N	(9)
2. To prepare for faculty visits?	V	O	S	R	N	(10)
3. In preparation for teaching other health professionals or lay people?	V	O	S	R	N	(11)
4. To explore sociological aspects of health care?	V	O	S	R	N	(12)
5. For writing papers, reports, etc?	V	O	S	R	N	(13)
6. For future use (but not related to a specific patient care question at the time)?	V	O	S	R	N	(14)
7. To explore a topic of interest?	V	O	S	R	N	(15)

What are other reasons you seek information?

____

____

____

____

III. Information Resources Used

How often did (do) you use the following resources when seeking information? (circle the appropriate response)

	Very Often	Often	Sometimes	Rarely	Never	
1. Your own book, textbook, journals or notes?	V	O	S	R	N	(16)
2. Your preceptor?	V	O	S	R	N	(17)
3. Other health professionals?	V	O	S	R	N	(18)
4. Local hospital library?	V	O	S	R	N	(19)
5. Physician's office or clinic library or collection of materials ?	V	O	S	R	N	(20)
6. Bio-Medical Library?	V	O	S	R	N	(21)
7. Other libraries?	V	O	S	R	N	(22)
8. Drug detail men?	V	O	S	R	N	(23)
9. Unsolicited medical information received through mail, etc?	V	O	S	R	N	(24)
10. Professional societies or organizations?	V	O	S	R	N	(25)

Do you obtain information from any other places or people?

____

____

____

____

IV. Recommended Library Services and Resources

Please indicate how important you consider the following library services or resources are to you. (circle the appropriate response)

		Very Important	Fairly Important	Of Some Importance	Fairly Unimportant	Not Important	
1.	Current books or textbooks	V	FI	O	FU	N	(26)
2.	Current journal subscriptions	V	FI	O	FU	N	(27)
3.	Index Medicus or Abridged Index Medicus	V	FI	O	FU	N	(28)
4.	Audiovisual materials	V	FI	O	FU	N	(29)
5.	A well-developed hospital library	V	FI	O	FU	N	(30)
6.	A local hospital librarian	V	FI	O	FU	N	(31)
7.	A method for obtaining material from Bio-Medical Library	V	FI	O	FU	N	(32)
8.	Use of MEDLINE or other computer bibliographic services	V	FI	O	FU	N	(33)
9.	Current Awareness Services (receiving the table of contents of new journals at specified intervals or similar method)	V	FI	O	FU	N	(34)
10.	Other (please state)	V	FI	O	FU	N	(35)

Any suggestions on library services or resources?

____

____

____

____

V. Local Hospital Library

Does your local hospital library provide the following:
(circle the appropriate response)

	Yes	No	Don't Know	
1. Current books and textbooks?	Y	N	DK	(36)
2. Current journals?	Y	N	DK	(37)
3. Index Medicus or Abridged Index Medicus?	Y	N	DK	(38)
4. Audiovisual materials?	Y	N	DK	(39)
5. A librarian or library manager?	Y	N	DK	(40)
6. Interlibrary loans (a method for borrowing books or obtaining photocopy of journal articles not available in the hospital library)?	Y	N	DK	(41)
7. Long library hours (or a key available after hours)?	Y	N	DK	(42)

Any comments about the local hospital library?

____

____

____

____

-over-

VI. Information Search Methods

A. Rank the following according to the sequence most often followed when searching for information. (place a number 1 in the space of the first resource usually checked for information, a number 2 in the second resource usually checked, etc. If rarely used or not applicable, enter a zero in the space).

1. Your own books, textbooks, journals. ________ (43)

2. Your preceptor. ________ (44)

3. Local hospital library. ________ (45)

4. Bio-Medical Library. ________ (46)

5. Other health professionals. ________ (47)

If the above is not applicable to your usual searching methods, please describe how you go about finding information.

____

____

____

____

VII. Location of library or learning resource center

Considering your work and study patterns, how would you rate the convenience of the following locations for a library or learning resource center? (circle the appropriate response)

	Very convenient	Fairly convenient	Convenient	Fairly inconvenient	Very inconvenient	
1. Doctors office or clinic	VC	FC	C	FI	VI	(48)
2. Local hospital	VC	FC	C	FI	VI	(49)
3. A regional (0-25 mile radius) information center	VC	FC	C	FI	VI	(50)

Comments:

Please return questionnaire to:

Gertrude Foreman
Bio-Medical Library
Diehl Hall
University of Minnesota
Minneapolis, MN 55455

APPENDIX 4

Questionnaire
to Hospital Libraries

I. Identification

1. Name of Hospital: ____

2. Does your hospital have a library?

_____yes

_____no

If yes, please answer the following questions.

II. Library Personnel

1. Does the library have a librarian or a person designated to manage the library?

_____yes

_____no

2. If you have a library manager, how many hours per week are used for library business?

_____hours per week

III. Library Services

1. Does the library provide the following services?

a. Reference service?

_____yes

_____no

b. Literature searches?

_____yes

_____no

c. Photocopy of journal articles?

_____yes

_____no

d. Arrange for MEDLINE searches?

_____yes

_____no

e. Interlibrary Loans?

_____yes

_____no

IV. Library Collection

1. Does the library receive the following indexes?

   a. Index Medicus

   _____yes

   _____no

   b. Abridged Index Medicus

   _____yes

   _____no

   c. Hospital Literature Index

   _____yes

   _____no

   d. International Nursing Index

   _____yes

   _____no

   e. Cumulative Index to Nursing Literature

   _____yes

   _____no

2. From the following list of periodical titles, please check any that your library receives on a regular basis.

   If you receive periodicals not listed, please give their titles:

   ____

   ____

   ____

   ____

   ____

   ____

Enclosed please find an addressed stamped envelope.
Thank you for your cooperation.

____ Journal of the American Medical Association
____ Annals of Internal Medicine
____ Minnesota Medicine
____ Lancet
____ New England Journal of Medicine
____ Archives of Internal Medicine
____ Western Journal of Medicine
____ American Journal of Nursing
____ Archives of Dermatology
____ Cancer
____ Circulation
____ American Journal of Cardiology
____ American Jouranl of Medicine
____ Annals of Surgery
____ Blood
____ British Medical Journal
____ Medical Clinics of North America
____ Medical Letter on Drugs and Therapeutics
____ Modern Healthcare (Modern Hospital)
____ Surgery
____ Hospitals
____ American Journal of Surgery
____ Anesthesiology
____ Archives of Surgery
____ CA
____ Mayo Clinic Proceedings
____ Surgery, Gynecology and Obstetrics
____ American Heart Journal
____ American Journal of Diseases of Children
____ Archives of Neurology
____ Journal of Laboratory and Clinical Medicine
____ Radiology
____ American Journal of Clinical Pathology
____ American Journal of Public Health
____ American Review of Respiratory Diseases
____ Archives of Otolaryngology
____ Archives of Pathology
____ Arthritis and Rheumatism
____ Chest
____ Journal of Bone and Joint Surgery (Amer)
____ Journal of Pediatrics
____ Journal of Urology
____ Postgraduate Medicine
____ Surgical Clinics of North America
____ American Journal of Obstetrics and Gynecology
____ DM;Disease a Month
____ Gastroenterology
____ Journal of Clinical Investigation
____ Journal of Thoracic and Cardiovascular Surgery
____ Nursing Outlook
____ Archives of Ophthalmology
____ Clinical Pharmacology and Therapeutics
____ Diabetes
____ Hospital Forum
____

____ Hospital Practice
____ Journal of Clinical Endocrinology and Metabolism
____ Nursing Clinics of North America
____ Pediatric Clinics of North America
____ Pediatrics
____ American Journal of Ophthalmology
____ American Journal of Roentgenology, Radium
Therapy and Nuclear Medicine
____ Annals of Thoracic Surgery
____ AORN Journal
____ Medicine
____ American Family Physician/GP
____ Bulleting of the American College of Surgeons
____ Current Problems of Surgery
____ Hospital Topics
____ Journal of Trauma
____ Modern Concepts of Cardiovascular Diseases
____ Obstetrics and Gynecology
____ Progress in Cardiovascular Disease
____ RN
____ Anesthesia and Analgesia
____ British Heart Journal
____ Clinical Orthopaedics and Related Research
____ Clinical Symposia
____ Gut
____ Neurology
____ Nursing Research
____ Plastic and Reconstructive Surgery
____ American Journal of the Medicial Sciences
____ British Journal of Radiology
____ Clinical Obstetrics and Gynecology
____ Journal of Infectious Diseases
____ American Jouranl of Clinical Nutrition
____ American Journal of Digestive Diseases
____ Archives of General Psychiatry
____ Archives of Physician Medicine and Rehabilitation
____ Jounral of Bone and Joint Surgery (Brit)
____ Journal of Neurosurgery
____ Orthopedic Clinics of North America
____ Clinical Pediatrics
____ Geriatrics
____ Radiologic Clinics of North America
____ Science
____ American Journal of Pathology
____ American Journal of Psychiatry
____ Annals of Otology, Rhinology and Laryngology
____ Brain
____ Canadian Medical Association Journal
____ Hospital Medicine
____ Laryngoscope
____ Metabolism, Clinical and Experimental
____ Seminars in Hematology

APPENDIX 5

THE CHI-SQUARED TEST

The Chi-squared test is often used in experimental work where the data consist of counts or frequencies. Each cell of Table II consists of a number of answers given in response to a reason for requesting information. For any reason, five answers are possible, very often, often, sometimes, rarely, or never. From our sample of 31 students, we have a total of 217 cell entries for the major categories.

Table II displays the data in 7 major categories of reasons and 3 classes of answers. The chi-squared test of association determines whether people responded to one reason differently than another. If reasons and answers are associated, the distribution of answers will change from reason to reasons.

To calculate the statistic, chi-squared, we proceed as if there were no association in Table II whatsoever. The column totals show 80 often or very often answers, 71 sometimes answers, and 66 rarely or never answers. If students' responses were assigned to reason categories independent of cause, we would expect (80/217) = 36.9 percent of the students to mark "often" or "very often," (71/217) = 32.7 percent would mark sometimes, and (66/217) = 30.4 percent would mark rarely or never. Since 31 students filled out the questionaire, 36.9%(31) would answer "often" or "very often" to each reason category. As a matter of fact, each row should contain the following counts if reason and answer categories are unassociated:

Often or Very Often	Sometimes	Rarely or Never
11.439 (0.369 x 31)	10.137 (0.327 x 31)	9.424 (0.304 x 31)

We have constructed a new table of expected cell counts, which will be compared to the table actually obtained. Is the real table different enough to conclude the categories are associated?

For each cell of the table, we have a real count and an expected count. Let 0 = the real (or observed) count and E = the expected count. To calculate chi-squared,

1. Calculate $(0-E)^2/E$ for each cell
2. Then add the result of Step 1 for all cells.

In statistical parlance, the formula is,

$$\chi^2 = \sum (O_i - E_i)^2 / E_i$$

The greater the difference in the observed and expected counts, the greater will be $(0-E)^2$ and thus will X^2(chi-squared) also be greater. A large value of X^2 means row and column categories are associated.

How large a X^2 value is large enough to conclude association can be gotten from the abridged Table in the appendix of Maxwell (1961). In order to find this "critical value", we enter the table with one parameter, which depends on the size of our table. The parameter is called "degrees of freedom" and equals the number of rows minus one times the number of columns minus one (v-1)(c-1) at (7-1)(3-1) = 12 degrees of freedom, we find four values of chi-squared, one each for 0.050, 0.025, 0.010, and 0.001 tail area probability. The 6 degrees of freedom row in Maxwell's table looks like this:

	Probability (P)			
DF	0.050	0.025	0.010	0.001
6	21.026	23.337	26.217	32.909

The numbers in the table mean this:

> The probability that our calculated X^2 exceeds 21.026 is 0.050 if the real data differ from the expected counts only because of sampling error (often said "chance alone").

You can substitute 23.337 and 0.025 in the above sentence or any other pair of values from the 12 DOF (degree of freedom) row in Maxwell's table.

Our calculated X^2 was 61.684 which exceeds the table value of X^2 at the 0.001 level. Thus, we conclude reasons for requesting information are associated with the answer categories.

Only one problem remains. The chi-squared test assumes that cell counts are uncorrelated. But our counts are. A person could not answer often or very often to all reasons and remain logically consistent. Therefore, a student who answers "often" or "very often" several times will likely include in some "rarely" or "never" responses or other reasons.

For each row of Table II we can calculate a chi-squared value simply by adding the $(O-E)^2/E$ values for each cell in the row. These values are contained in the right hand column of Table II . Each one of these rows contains 2 degrees of freedom. Now we compare the X^2's calculated for each row to the chi-squared values in the Bonferonni Chi-squared table, found in Kramer (1972):

For t=7 Rows
Probability (P)

DF	0.100	0.050	0.025	0.010
2	8.497	9.883	11.270	13.102

None of our row X^2 are larger than the values above. Even though the table in Kramer gives no chi-squared values for probabilities higher than 0.100, they can be calculated by a formula found in Jensen.* By Jensen's formula, we conclude that the probability that 8.140 would be exceeded if there were no difference is 13%. The formula is quite conservative and in truth, the probability is likely less than 13%.

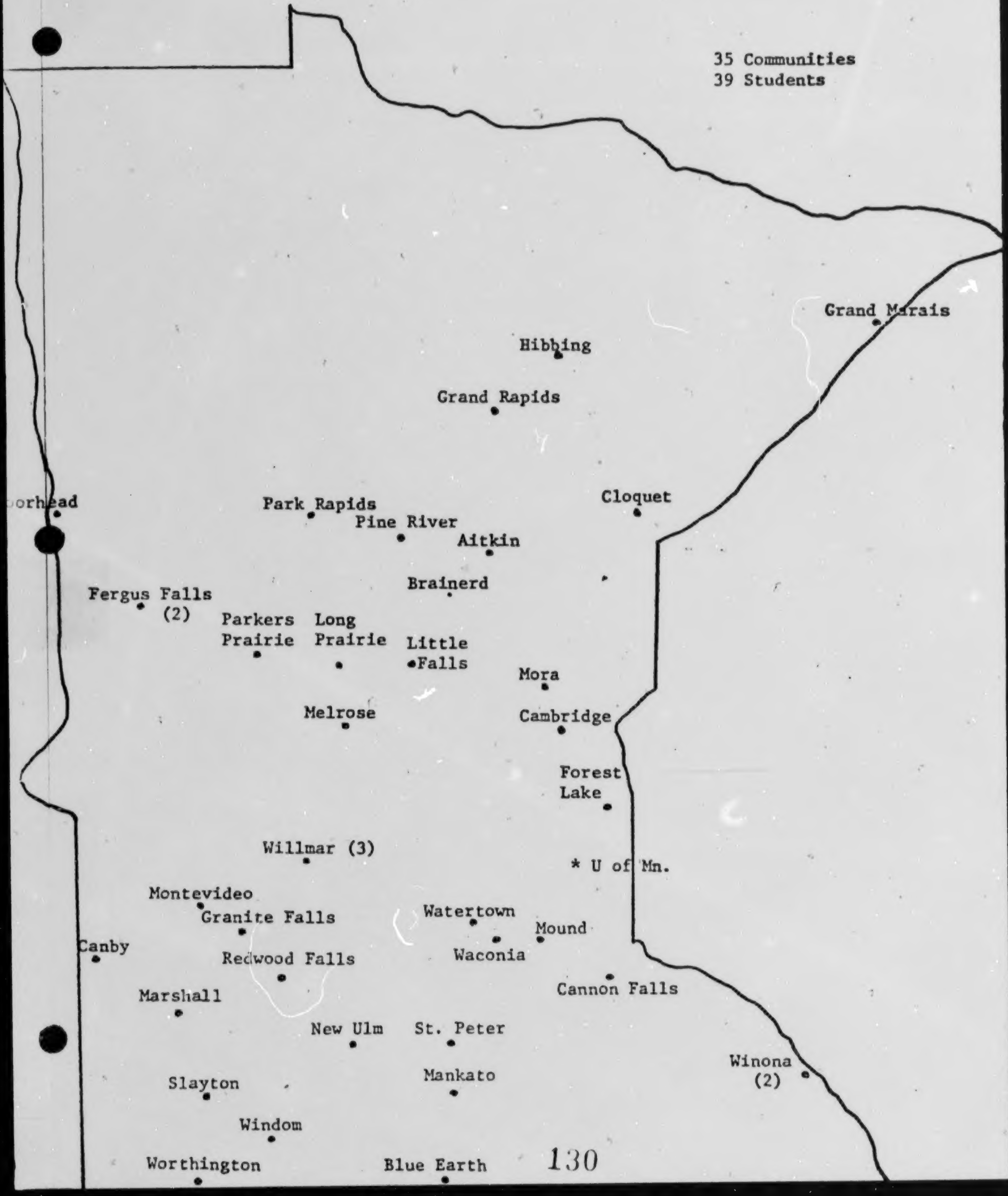
*Jensen, Donald R. and Storm, George. Simultaneous statistical tests on categorical data. The Jouranl of Experimental Education. 36:46-56, Summer 1968.

The large X^2 value of 61.684 for the entire table strongly supported a conclusion of association. The Bonferonni method gave weak support (8.140). The first method assumed uncorrelated data; the Bonferonni method assumed the worst possible correlation. When we gave up the assumption of uncorrelated data, our conclusion lost some of its strength.

B.G.

APPENDIX 6

RURAL PHYSICIAN ASSOCIATE PROGRAM
Student Locations, 1977-78


35 Communities
39 Students
Grand Marais
Hibbing
Grand Rapids
Cloquet
orhead
Park Rapids
Pine River
Aitkin
Brainerd
Fergus Falls (2)
Parkers Prairie
Long Prairie
Little Falls
Mora
Melrose
Cambridge
Forest Lake
Willmar (3)
* U of Mn.
Montevideo
Granite Falls
Watertown
Mound
Canby
Waconia
Redwood Falls
Cannon Falls
Marshall
New Ulm
St. Peter
Winona (2)
Slayton
Mankato
Windom
Worthington
Blue Earth

Appendix 7

Master List of Sixty Journal Titles

1. Acta Medica Scandinavica
2. American Dietetic Association Journal
3. American Heart Journal
4. American Journal of Cardiology
5. American Journal of Clinical Nutrition
6. American Journal of Clinical Pathology
7. American Journal of Digestive Diseases
8. American Journal Of Diseases of Childhood
9. American Journal of the Medical Sciences
10. American Journal of Medicine
11. American Journal of Obstetrics and Gynecology
12. American Journal of Pathology
13. American Journal of Psychiatry
14. American Journal of Public Health
15. American Journal of Surgery
16. American Review of the Respiratory Diseases
17. Anesthesiology
18. Annals of Internal Medicine
19. Annals of Thoracic Surgery
20. Archives of Dermatology
21. Archives of General Pathology
22. Archives of Internal Medicine
23. Archives of Neurology
24. Archives of Ophthalmology
25. Archives of Otolaryngology
26. Archives of Physical Medicine and Rehabilitation
27. Archives of Surgery
28. Blood
29. British Heart Journal
30. British Journal of Surgery
31. British Medical Journal
32. Cancer
33. Chest
34. Circulation: Journal of the American Heart Association
35. Clinical Pediatrics
36. Clinical Pharmacology and Therapeutics
37. DM: Disease-A-Month
38. Gastroenterology
39. Geriatrics
40. Gut
41. Journal of the American Medical Association
42. Journal of Bone and Joint Surgery, American
43. Journal of Clinical Endocrinology and Metabolism
44. Journal of Clinical Investigation
45. Journal of Infectious Diseases

46. Journal of Laboratory and Clinical Medicine
47. Journal of Pediatrics
48. Journal of Thoracic and Cardiovascular Surgery
49. Journal of Trauma
50. Journal of Urology
51. Lancet
52. Medical Letters on Drugs and Therapeutics
53. Medicine
54. New England Journal of Medicine
55. Obstetrics and Gynecology
56. Postgraduate Medicine
57. Progress in Cardiovascular Diseases
58. Radiology
59. Surgery
60. Surgery, Gynecology and Obstetrics

	Brandon	Kamenoff	AIM
Acta Medica Scandinavica	X	X	X
Acta Radiologica		X	
Adolescence		X	
American College of Surgeons. Bulletin		X	
American Dental Association Journal	X		
American Dietetic Association Journal	X	X	X
American Family Physician	X		X
American Geriatric Society Journal	X		
American Heart Journal	X	X	X
American Journal of Cardiology	X	X	X
American Journal of Clinical Nutrition	X	X	X
American Journal of Clinical Pathology	X	X	X
American Journal of Digestive Diseases	X	X	X
American Journal of Human Genetics	X		X
American Journal of the Medical Sciences	X	X	X
American Journal of Medicine	X	X	X
American Journal of Nursing	X	X	
American Journal of Obstetrics and Gynecology	X	X	X
American Journal of Ophthalmology	X		X
American Journal of Pathology	X	X	X
American Journal of Physical Medicine	X		X
American Journal of Physiology	X		
American Journal of Psychiatry	X	X	X
American Journal of Public Health	X	X	X
American Journal of Roentgenology, Radium Therapy and Nuclear Medicine	X	X	X
American Journal of Surgery	X	X	X
American Journal of Tropical Medicine and Hygiene	X		X
American Review of Respiratory Disease	X	X	X
Anaesthesia	X		X
Anesthesiology	X	X	X
Angiology	X		
Annals of Allergy	X		
Annals of Internal Medicine	X	X	X
Annals of Otology, Rhinology and Laryngology	X		X
Annals of Surgery	X		X
Annals of Thoracic Surgery	X	X	X

	Brandon	Kamenoff	AIM
Annual Review of Medicine		X	
Archives of Dermatology	X	X	X
Archives of Diseases in Childhood		X	
Archives of Environmental Health	X		X
Archives of General Psychiatry	X	X	X
Archives of Internal Medicine	X	X	X
Archives of Neurology	X	X	X
Archives of Ophthalmology	X	X	X
Archives of Otolaryngology	X	X	X
Archives of Pathology			X
Archives of Pathology and Laboratory Medicine	X		
Archives of Physical Medicine and Rehabilitation	X	X	X
Archives of Surgery	X	X	X
Arthritis and Rheumatism	X		X
Blood	X	X	X
Brain	X		X
Briefs:Footnotes on Material Care		X	
British Heart Journal	X	X	X
British Journal of Haematology		X	
British Journal of Obstetrics and Gynaecology	X		X
British Journal of Radiology	X	X	
British Journal of Surgery	X	X	X
British Journal of Radiology	X		X
British Journal of Urology		X	
British Medical Journal	X	X	X
Bulletin of the History of Medicine	X		
CA		X	
Cancer	X	X	X
Canadian Medical Association Journal	X		X
Cardiolvascular Diseases		X	
Chest	X	X	X
Circulation: Journal of the American Heart Assn.	X	X	X
Circulation Research		X	

	Brandon	Kamenoff	AIM
Cleveland Clinic Quarterly		X	
Clinical Orthopedics		X	
Clinical Obstetrics and Gynecology	X		
Clinical Pediatrics (Philadelphia)	X	X	X
Clinical Pharmacology and Therapeutics	X	X	X
Clinical Toxicology (New York)			X
Consumer Reports		X	
Critical Care Medicine		X	
Current Medical Research and Opinion		X	
DM: Disease-a-Month	X	X	X
Diabetes	X		X
Diseases of the Colon and Rectum	X	X	
Endocrinology	X		X
Federal Register		X	
Fertility and Sterility	X		
Gastroenterology	X	X	X
Geriatrics	X	X	X
Gut	X	X	X
Health Services Reports		X	
Health Services Research (Chicago)			X
Heart and Lung	X	X	
Hospital and Health Services Administration	X		
Hospital Medical Staff	X		
Hospital Progress		X	
Hospital Topics		X	
Hospitals	X	X	
Inquiry: Journal of Medical Care Organization Provision and Financing	X		X
Investigative Urology	X		
JAMA: Journal of the American Medical Assn.	X	X	X
JOGN		X	
Journal of Allergy and Clinical Immunology	X		X
Journal of Applied Physiology	X		
Journal of Bacteriology	X		
Journal of Biological Chemistry	X		

	Brandon	Kamenoff	AIM
Journal of Bone and Joint Surgery. American	X	X	X
Journal of Bone and Joint Surgery. British		X	X
Journal of Clinical Endocrinology and Metabolism	X	X	X
Journal of Clinical Investigation	X	X	X
Journal of Clinical Pathology	X		X
Journal of Experimental Medicine	X		X
Journal of Gerontology	X		X
Journal of the History of Medicine	X		
Journal of Immunology	X		X
Journal of Infectious Diseases	X	X	X
Journal of Investigative Dermatology	X		X
Journal of Laboratory and Clinical Medicine	X	X	X
Journal of Laryngology and Otology	X		X
Journal of Medical Education	X		X
Journal of Nervous and Mental Disease	X		X
Jouranl of Neurology, Neurosurgery and Psychiatry		X	
Journal of Neurosurgery	X		X
Journal of Nuclear Medicine		X	
Journal of Nursing Administration		X	
Journal of Oral Surgery	X		X
Journal of Pediatrics	X	X	X
Journal of Pharmacology and Experimental Therapeutics	X		
Journal of Practical Nursing		X	
Journal of Reproductive Medicine		X	
Jouranl of Surgical Research		X	
Journal of Thoracic and Cardiovascular Surgery	X	X	X
Journal of Trauma	X	X	X
Journal of Urology	X	X	X
Lancet	X	X	X
Mayo Clinic Proceedings		X	
Medical Care (Philadelphia)	X		X
Medical Clinics of North America	X	X	
Medical Letter on Drugs and Therapeutics	X	X	X
Medicine(Baltimore)	X	X	X
Milbank Memorial Fund Quarterly (New York)			X

	Brandon	Kamenoff	AIM
Modern Health Care	X		
Modern Hospital		X	
National Cancer Institute Journal	X		
Neurology	X	X	
New England Journal of Medicine	X	X	X
Nursing 74-76		X	
Nursing Care		X	
Nursing Clinics of North American	X	X	
Nursing Digest		X	
Nursing Forum	X	X	
Nursing Mirror		X	
Nursing Outlook	X	X	
Nursing Research	X	X	
Nursing Times		X	
Nursing Update		X	
Nutrition Reviews	X		
Obstetrics and Gynecology	X	X	X
Oral Surgery, Oral Medcine, Oral Pathology	X		
Otolaryngology Clinics of North America	X		
Pediatric Nursing Currents		X	
Pediatric Clinics of North America	X	X	
Pediatrics	X	X	
Pharmacology Review	X		
Physical Therapy: Journal of the American Physical Therapy Association	X		X
Pediatrics	X		X
Physiological Review	X		
Plastic and Reconstructive Surgery	X		X
Postgraduate Medicine	X	X	X
Progress in Cardiovascular Diseases	X	X	X
Public Health Reports	X		X
Radiology	X	X	X
Radiologic Clinics of North America	X		
Rheumatology and Rehabilitation	X		X

	Brandon	Kamenoff	AIM
Science	X	X	
Scientific American		X	
Smoking and Health		X	
Social Casework		X	
Southern Medical Journal			X
Stroke		X	
Supervisor Nursing		X	
Surgery	X	X	X
Surgery Annual		X	
Surgery, Gynecology and Obstretrics	X	X	X
Surgical Clinics of North America	X	X	
Urology		X	
American Journal of Disease of Childhood	X	X	X
International Surgery		X	

Appendix 8

Local List of Forty-Seven Titles

1. Acta Obstetrica Gynecologica Scandinavica
2. American Heart Journal
3. American Journal of Cardiology
4. American Journal of Diseases of Childhood
5. American Journal of Medicine
6. American Journal of Obstetrics and Gynecology
7. American Journal of Surgery
8. American Review of the Respiratory Diseases
9. Annals of Internal Medicine
10. Annals of Surgery
11. Archives of Diseases of Children
12. Archives of Internal Medicine
13. Archives of Surgery
14. British Medical Journal
15. Canadian Medical Association Journal
16. Cancer
17. Cardiovascular Clinics
18. Chest
19. Circulation
20. Clinical Orthopedics
21. Clinics in Obstetrics and Gynecology
22. Diabetes
23. Gastroenterology
24. Geriatrics
25. Gynecology and Obstetrics
26. JAMA: Journal of the American Medical Association
27. Journal of Neurosurgery
28. Journal of Pediatric Surgery
29. Journal of Pediatrics
30. Journal of Reproductive Medicine
31. Journal of Urology
32. Lancet
33. Mayo Clinic Proceedings
34. Medical Clinics of North America
35. Minnesota Medicine
36. Neurology
37. New England Journal of Medicine
38. New York Journal of Medicine
39. Obstetrics and Gynecology
40. Pediatric Clinics of North America
41. Pediatrics
42. Postgraduate Medical Journal
43. Postgraduate Medicine
44. Practitioner
45. Southern Medical Journal
46. Surgery, Gynecology and Obstetrics
47. Surgical Clinics of North America

Ten Most Used Journals

Rank	Title	Times Used
1.	New England Journal of Medicine	49
2.	Medical Clinics of North America	42
3.	Obstetrics and Gynecology	41
4.	JAMA	39
5.	American Journal of Obstetrics and Gynecology	37
6.	Pediatrics	35
7.	British Medical Journal	34
8.	Cancer	28
9.	Archives of Internal Medicine	26
10.	Journal of Pediatrics	26

RPAP Journal Use

acta anaesthes scan	1
acta cardiology (brux)	2
acta chir scand	2
acta cytol	3
acta derm venerol	3
acta endo KBH	1
acta hemat	1
acta hepatogast	2
acta med scand	7
acta neurochir (wein)	1
acta neuro scand	6
acta neuropath	1
acta obstet gynec scand	10
acta ophthalmol	1
acta orthop scand	1
acta otolaryngol	3
acta paed scand	4
acta pathol microbiol scand	3
acta psychiat scand	1
acta radiol	1
advances biochem psychopharm	1
adv cardiol	3
adv exp med biol	3
adv intern med	5
adv metab disorders	1
adv neurol	1
adv pediatrics	5
amer acad child psych j.	2
amer acad ophthalmol oto trans	1
am dent assoc j	1
am diet assoc j	1
am fam physician	9
am geriat soc j	3
am heart j	18
am j anat	1
am j cardiol	12
am j cardiovasc	1
am j clin pathol	6
am j dig dis	4
am j dis child	18
am j epidem	2
am j gastroent	3
am j genet	1
am j med	18
am j nurs	3
am j obstet gynec	37
am j ophthal	1
am j orthopsych	1
am j orthopsychiat	1
am j path	2
am j proctol	3
am j psych	4
am j pub health	2
am j roent radium...	8
am j surg	15
am j med sci	1

amer neurol assoc trans	1
am rev resp dis	14
am surg	7
anesthes analges	2
anesthesia	2
anesthesiology	1
angiologia	1
angiology	3
ann allergy	1
ann chir gynec fenn	2
ann clin lab sci	7
ann clin res	5
ann intern med	20
ann occup hygiene	1
ann ophthalmol	4
ann of otol	3
ann surg	17
ann thor surg	7
ann rev med	7
antimicrob agents chem	7
arkansas med soc j	1
arthritis rhemmat	3
arch derm	9
arch dis child	10
arch environ health	2
arch gen psych	4
arch gynaekol	1
arch intern medicine	26
arch neurol	5
arch ophth	2
arch otolaryngol	1
arch pathol	6
arch phy med rehab	3
arch surg	14
arch toxicol	1
assoc physicians of India j	5
atherosclerosis	1
aust nz j med	2
aust nz j surg	1
behav research ther	2
biblo cardiol	1
biol neonate	1
biomedicine	1
birth defects	8
blood	4
blut	1
brain	4
br heart j	5
br j the addict	3
br j aneasthes	2
br j angio	1
br j cancer	2
br j clin pharm	7
br j derm	5

brit j haemat		3
brit j ob/gyn		7
brit ophthal		1
brit j oral surg		1
brit j prev soc med		1
brit j psych		3
brit j radiol		4
brit j surg		6
brit j urol		2
brit med j		34
brit j urol		1

ca		1
can assec radiol j		2
can j otolaryngol		2
can j surg		3
can med assoc j		15
can psy assoc j		1
cancer		28
cancer chemo therapy rep		4
cancer res		1
chemotherapy		1
cancer treatment reports		1
cardiology		1
cardiovascular clinics		14
cardiovasc nurs		1
cent afr j med		1
chest		16
child dev		1
child psych and human dev	1	1
circulation		15
clin chim acta		1
clinical biochem		1
clinical chem		5
clinical experiemt immunol		1
clinical genetics		3
clin immunol immunopathol		2
clinical med child neurol		1
clinical neurol neurosurg		1
clinical neurol		1
clinical oncology		1
clinical orthop		11
clin ped		9
clinical pharacol ther		3
clinical prob surg		1
clin radiol		1
clinical toxio		3
clinics in endo metab		6
clinics in gastro		6
clinics in haematol		3
clinics in ob/gyn		18
clinics in perinatol		4
community mental health		1

comprehensive psych	1
conn med	3
contraception	1
critical card medicine	1
current probl ped	1
current prob surg	1
curr ther res	
dm	8
dan med bull	1
dermatologica	2
dev med child neurol	5
dev med child	1
dev psychobiol	1
diabetes	11
diabetolgia	4
digestion	3
dis colon rectum	7
dis nerv system	2
drug intell clin pharm ?	1
electroenceph clin neurol	2
endocrinology	2
epilepsia	2
Europ neurol	2
Eur Surg res	1
eye, ear nose throat monthly	1
fed proc	2
fertil-steril	8
folia haemat	1
folio psychiat neurol	1
GP	1
gastroentrol	20
gastroentestional endoscopy	1
geriatrics	10
gut	4
guys hospital	1
gynecology oncology	4
gynecology and obstetrics	13
hastings center reports	1
headache	6
heart lung	2
helv paediatr acta	2
horm metab research	4
hosp community psych	2
hospital forum	1
hospitals	1
hum pathol	2

Ill Med J	1
indian heart J	1
indian j chest dis	1
indian j med res	1
indian j ped	2
indiana j physiol pharm	1
indian med assoc j	3
indiana ped	3
indiana state med assoc j	1
injury	1
int anesth clin	1
int j clin exp hyp	1
int j derm	3
int j fertil	1
int ophthal clinics	2
int j psychiatry	1
int surg	4
int j addict	5
iowa med assoc j	1
isr j med sci	1
jama	39
japanese j surg	2
johns hopkins med j	3
j abnormal psych	2
j allergy clin imm	3
j appl physiol	1
j bone and join surg	8
j cardiovascular diseases	1
j cardio surg	6
j child psychol psychiatry	1
j chronic dis	3
j clin endo metab	6
j clin microbiol	1
j clin path	4
j electrocardio	1
j endocrinol	2
j fam pract	3
j infect dis	4
j lab clinc med	1
j laryngol	3
j med educat	1
j med genet	1
j nerv dis	3
j neurology	1
j neurol neursurg psych	4
j neurosurg	14
j nuclear med	4
j ob/gyn	5
j occp med	2
j ophth	1
j orthopsy	1
j otolaryn	1
j ped surg	20
j peds	26

j perinat med	1
j pharm pharmacol	1
j pharm exp ther	2
j phys med rehab	1
j psych res	1
j pub health	1
j rehab	1
j reprod med	12
j rheumatol	6
j school health	1
j sports med phys fit	1
j steroid biochem	1
j stud alcohol	2
j surg oncol	5
j surg res	2
j thor surg	9
j trauma	4
j trop med hyg	2
j trop pediat	1
j urol	19
kansas med soc j	1
kidney inter	1
klin woch	1
lancet	31
laryngol otol	1
laryngoscope	3
life sciences	3
LA state med soc j	3
maine med assoc j	4
Major prob clin surg	1
mayo clinic proc	18
med ann dc	1
med care review	1
med clinc north amer	42
med j aust	5
med lett	3
medical rec news	1
med times	6
medicine	5
metabolism	1
methods inf med	1
mich med	1
milit med	2
minn med	13
missouri med	1
miss state med assoc j	1
mod concepts cardiovas disl	1
mod prob ophthal	1
mod probl paed	1
modern treatment	5
mt sinai j med	1

nebraska med j	2
neurology	10
nejm	49
new jersey med soc j	4
new york acadm med	3
new york acad sci ann	6
new york j medicine	11
nursing	1
nursing research	2
nutrition reviews	9
occ health nurs	1
ohio state med j	2
oncology	1
oral surg	1
ortho clin n amer	4
otorhinolaryngol	2
ob/gyn	41
ob/gyn surv	4
patient care	1
pediatr ann	4
ped clin n amer	20
pediatr res	2
pediatric surgery	1
pediatrics	35
pa med	2
prospec biol med	4
pharmakopsychiat neuropsychopharm	1
phys ther	8
physiotherapy	2
postgrad med j	20
postgrad med	24
practitioner	12
prev med	1
primary care	1
prog cardio dis	8
prog clin immunology	1
prog liver dis	4
prog med virol	1
prog ped surg	1
psychiat quarterly	1
psycho bull	4
psychology med	1
psychosomatics	3
psychotherapy	2
psychother pscyhosom	1
public health reports	2
quart j med	3
quarterly j study alcohol	2

radiology	5
radiol clin n a	5
recent adv study cardio struct	1
rec prog hormone research	2
respiration	2
respir physiol	1
resuscitation	1
rev ob/gyn survl	
rev surg	3
rheumatol rehabil	1
rock mt med j	2
roy coll gen pract j	1
roy soc med	9
scand j gastro	5
scand j haematol	1
scand j resp dis	5
scand j rheumatol	1
scand j thorac card surg	2
science	5
scot med j	2
semin arthritis rheum	4
sem haematol	4
semin nucl med	2
semin oncol	4
semin roentgl	1
soc sci med	2
south afric med j	3
sd j med	2
southern med j	18
steroids	2
stroke	1
surgery	9
surgery annual	1
surg/gyn obstet	13
surg clin north amer	21
surg forum	1
surg neuol	4
tenn med assoc j	2
texas med	4
thorac cardio surg	1
thorax	2
throm diath haem	2
tissue antigens	2
transfusion	1
trustee	1
us nat cancer institute j	4
urol clinics n amer	3
urology	7

virchows arch cell path	2
virchows arch path anat	1
va med monthly	4
vitamins horm	1
west j med	6
wisc j med	5
zenalse bakteriol	1
z kinder	1

Titles = 256 Articles = 1879

Appendix 9

Hospital Library	No. of Journal Subscriptions	Has a library ?	Has Reference Service	Provides Literature Searches	Provides Photocopy	Provides access to MEDLINE	Has a librarian	Has Index Medicus	Has A.V.	Provides ILL	libraria hours per week
1	0	no	no	no	no	no	no	no	no	no	–
2	28	yes	yes	yes	yes	yes	yes	yes	yes	yes	20
3	19	yes	yes	yes	yes	no	yes	yes	no	no	10
4	17	yes	no	no	yes	yes	no	no	no	yes	–
5	20	yes	yes	yes	yes	yes	yes	yes	no	yes	1
6	41	yes	yes	yes	yes	yes	yes	yes	yes	yes	20
7	13	yes	yes	yes	yes	yes	yes	yes	no	yes	3
8	63	yes	yes	yes	yes	yes	yes	yes	yes	yes	30
9	23	yes	no	yes	yes	yes	no	yes	yes	yes	–
10	1	no	no	no	no	no	no	no	no	no	–
11	13	no	no	no	no	no	no	no	no	no	–
12	60	yes	yes	yes	yes	yes	yes	yes	yes	yes	–
13	0	no	no	no	no	no	no	no	no	no	–
14	5	yes	no	no	yes	no	yes	no	no	no	1
15	14	yes	yes	yes	yes	yes	yes	no	no	yes	35
16	12	yes	yes	yes	no	yes	yes	yes	no	yes	-
17	22	yes	yes	yes	yes	no	yes	yes	yes	yes	20
18	0	yes	no	no	no	no	no	no	no	no	-
19	5	yes	no	no	no	no	no	yes	no	no	-
20	29	yes	yes	no	yes	no	no	yes	no	no	–
21	19	yes	no	no	no	no	yes	yes	no	no	2
22	1	yes	yes	no	no	no	no	no	no	no	–
23	3	no	no	no	no	no	no	no	no	no	-
24	11	yes	no	no	no	no	no	no	no	yes	–
	11	yes	no	no	no	no	no	yes	no	no	–
	9	yes	yes	no	no	no	yes	no	yes	no	-
	2	yes	yes	yes	yes	yes	yes	yes	no	yes	-
	30	yes	yes	yes	yes	yes	yes	yes	no	yes	24

N = 28

Appendix 10

Sept. 1976 - April 1977

ILL Requests Received from Non-Metropolitan Physicians. Journal Requests Only

1. Acta Chirurgica Scand	1
2. Acta Patholmicro Biol Scand	1
3. American College of Emergency Physicians	1
4. American Heart Journal	2
5. American Journal of Cardiology	4
6. American Journal of Disease of Childhood	1
7. American Journal of Digestive Diseases	3
8. American Journal of Insanity	1
9. American Journal of Obstetrics and Gynecology	16
10. American Journal of Psychiatry	3
11. American Journal of Surgery	2
12. American Review of the Respiratory Diseases	2
13. American Surgeon	1
14. Anesthesiology	1
15. Annals of Allergy	1
16. Annals of Surgery	2
17. Archives of Environmental Health	1
18. Archives of Internal Medicine	1
19. Archives of Neurology	2
20. Archives of Surgery	2
21. Bio-Med Engineering	1
22. Blood	1
23. British Journal of Radiology	2
24. British Journal of Surgery	2
25. British Medical Journal	4
26. Canadian Anesth. Soc. J.	1
27. Canadian Medical Assoc. Journal	1
28. Cancer	6
29. Chest	1
30. Circulation	8
31. Clin. J. Obstretrics and Gynecology	1
32. Canadian Journal of Surgery	2
33. Clin. Proc. Child Hosp. Wash.	1
34. Clinical Research	1
35. Clinical Toxicology	1
36. Connecticut Medicine	1
37. Epilepsia	1
38. Gastroenterology	2
39. Gut	1
40. Indian Journal of Chest Diseases	1
41. Indian Journal Medical Reserach	1
42. Indiana State Medical Assoc. J.	1
43. Iowa Medical Soc. J.	1
44. JAMA	2
45. Japn. Heart Journal	1
46. J. Allergy Clin. Imm.	2

47. J. Behavioral Therapy & Experimental Psych	1
48. J. Clinical Pathology	2
49. J. Clinical Investigation	1
50. J. Clinical Ultrasound	2
51. J. Forensic Science	1
52. Journal of Infectious Diseases	1
53. J. Laryngol Otol	1
54. J. Neurological Science	1
55. J. Neurology	1
56. J. Nerv. Ment Diseases	1
57. J. Obstetrics and Gynecology,Brit. Comm.	1
58. J. Pediatrics	4
59. J. Reproductive Medicine	1
60. J. Thoracic Cardiovascular Surgery	1
61. J. Trauma	2
62. J. Urology	3
63. Lancet	4
64. Med Biol Eng	1
65. Med J. Aust	3
66. Med Res Engineer	1
67. Mayo Clinic Proceedings	2
68. Military Medicine	1
69. Nature	1
70. Neurology	1
71. Neuroradiology	1
72. Nursing Clinics of North America	1
73. NEJM	7
74. Obstretrics and Gynecology	6
75. ONA J	1
76. Oral Health	1
77. Postgraduate Medicine	1
78. Postgraduate Medical Journal	2
79. Psyciatric Quarterly	1
80. Radiology	5
81. Royal Soc. of Med. Proc.	1
82. Royal Coll. Surg. Ann.	1
83. Scand J. Infect. Dis.	1
84. Science	1
85. Seminars in Hematology	1
86. Southern Medical Journal	1
87. Surgical Clinics of North America	2
88. Surgery, Gynecology, and Obstetrics	2
89. Surgery	4
90. Ultrasonics	1
91. Urology	1
92. Zeitschrift fur die Ges Innere Medicin	1

Journals Requested More Than 5 Times

Titles	
American Journal of Obstetrics and Gynecology	16
Cancer	6
Circulation	8
Obstetrics and Gynecology	6
Radiology	5

Appendix 11

CONSORTIUM SURVEY

1. BACKGROUND INFORMATION

A/ When and why was your Consortium first organized?

When-

Why-

B. Please give a brief description of your Consortium. (How is it sturctured? Are there formal agreements? Etc.)

C. How many members belong to your Consortium?

D. What types of libraries are members of your Consortium?

II. INTERLIBRARY LOAN ACTIVITIES:

A. During the past calender year, 1976, how many loans did your consortium members fill for other institutions within your consortium?

B. During that same year, how many loans did your consortium libraries fill for institutions outside of your consortium?

Survey of Consortia Activities

B. Is your Consortium a Limited Designated Library, i.e., may your Consortium refer interlibrary loan requests to out-of-state Resource Libraries?

Yes________ No________

C. Do the members of your Consortium offer interlibrary loan service to local libraries or other institutions which probably do not use the Midwest Health Science Library Network?

Yes________ No________

III. Educational Activities:

A. Does your Consortium hold regular meetings?

Yes________ No________

How frequently?

Are these meetings social, educational or business meetings?

Please list some of the topics discussed at these meetings.

B. Does your Consortium publish a newsletter?

Yes________ No________

C. Has your Consortium published any educational or instructional handbooks or manuals?

Yes________ No________

Please list the titles of these publications.

Survey of Consortia Activities

D. Does your consortium sponsor any other educational activities?

Yes________ No________

If so, please describe them.

IV. Cooperative Activities:

A. Has your Consortium compiled a union list of serials?

Yes________ No________

How was it produced?

B. Do the members of your Consortium provide reference service to each other?

Yes________ No________

C. Do the members of your Consortium share Medline services?

Yes________ No________

Please describe your arrangement.

D. Does your Consortium have a cooperative acquisitions program?

Yes________ No________

Please explain.

Survey of Consortia Activities

E. Does your Consortium have a cooperative audiovisual program?

Yes________ No________

If so, please describe the program.

F. Does your Consortium share any technical services? (technical services are activities concerned with obtaining, organizing, and processing library material for use.)

Yes________ No________

Please list them.

G. Does your Consortium provide consultation service to members?

Yes________ No________

Please explain.

H. Does your Consortium have a policy of "open access" for health care practitioners from member institutions?

Yes________ No________

I. Do the members of your Consortium share expenses?

Yes________ No________

Please explain how your activities are funded.

J. Has your Consortium received any grant funds?

Yes________ No________

Please explain.

Survey of Consortia Activities

K. Does your Consortium engage in any other cooperative activities?

Yes________ No________

Please list these activities.

V. Outreach Activities:

A. Do the members of your Consortium provide informational services to health care practitioners who are not affiliated with member institutions?

Yes________ No________

What services do you provide?

B. Does your Consortium sponsor any type of outreach activities for non-member institutions?

Yes________ No________

If so, please explain.

VI. Other Activities:

Please use this space to describe any other programs or projects sponsored by your Consortium.

Survey of Consortiia Activities

VII. MISCELLANEOUS

A. How many Consortium members have one or more professional librarians on their staff?

B. When the members of your consortium request materials from other members of your consortium, how are those requests initiated?

% by telephone ____________

% by mail ____________

C. Of those requests that are filled by your consortium members for their fellow members, what's the average time, in your estimation, from the initiation of the request to the receipt of the materials?

D. Do your consortium members have a formal or informal agreement to give priority to filling fellow members' requests for materials?

E. Which members of your consortium, if any, are primarily borrowers?

F. Which, if any, are primarily lenders?

APLA MEMBER SURVEY

Appendix 12

A. BACKGROUND INFORMATION

1. When was your library established?

2. When and why did you first join APLA?

   when-

   why-

3. Describe any formal agreements (such as the sharing of expenses, the payment of membership dues, etc.) that exist betwn you and APLA.

4. What is the size of your collection?

   # books ____________

   # journals ____________

   # A.V. programs ____________

5. List any A.V. equipment that your library owns.

6. Is your collection circulating or non-circulating?

7. How many square feet does your library have?

8. What personnel staff your library? (If any are other that full time, please indicate.)

9. What hours is your library open during the week?

10. Please cicrle each of the following services that your library provides.
    - a. Reference
    - b. Photocopy
    - c. Manual searches
    - d. Access to MEDLINE
    - e. ILL
    - f. Other, such as LATCH, SDI, OUTREACH programs, etc. (Please descr

B. LEVEL OF SERVICE

1. # of books used/month?

2. # of jnls used/month?

3. # of A.V. programs used/month?

4. # of materials loaned/month to other Consoritum members?

5. # of materials loaned/month to non-Consortium members?

6. # of materials borrowed/month from other Consortium members?

7. # of materials borrowed/month from resource libraries?

from Bio-Med ________

Duluth ________

Mayo ________

APLA MEMBER SURVEY

8. How are requests made to Consortium members initiated?

% by telephone __________

% by mail __________

9. Of the requests you make to Consortium members (and which are filled), what is the average time it takes between the initiation of the request, and the receipt of the materials?

10. What is the breakdown of your primary clientele?

# physicians __________

# nurses __________

# allied H.P. __________

C. FINANCIAL INFORMATION

1. List the major sources of funding for your library.

2. What is the dollar sum of the library's annual operating budget?

D. EDUCATIONAL OPPORTUNITIES

1. How often are Consortium meetings held/year?

2. Does your library have any of the following? (Please circle)

- Membership to MLA
- Membership to MHSLA

Appendix 13

The Educator/Librarian

During the past decade, the role of the various health professionals has expanded to facilitate the changes in heatlh care delivery. The medical librarian, too, has extended the responsiblities, perogatives, and services of the library profession.

In the last few years, however, several circumstances have developed which place a new stress and importance on this professional's work. These circumstances can be summarized in the following way:[1]

1. The advent of decentralized medical, nursing, pharmacy, and allied health education has increased the volume of education resource demands placed on the library or institution housing these "off-site" professionals-in-training.

2. Continuing education in many of the health professions is becoming mandatory (i.e., pharmacy and nursing). In order to accommodate this educational need the regionally-based institutions, such as the local hospital, are being identified as sites for fulfilling these requirements either through individualized or group programs. The library is thus being viewed as a learning resource center which can assist in this need.

3. The emergency of mediated patient education has identified the need for patients to have access to collections of education materials which are part of formal education efforts. The library is viewed optimistically as the logical tie to this activity.

4. Staff development programs and schools of nursing attached to larger hospitals are increasing their use of media and materials for self-instruction.

5. At university academic health centers, where educational development has been formalized, the call for medical librarians as knowledgeable and competent information specialists on the development team is emerging. The systematic design of instruction has placed a more critical value on libraries since much development results in teaching strategies of self-instruction and small group uses of mediated materials. Integral to these strategies is the management of the library learning center and involvement of its staff in the design activity.

As proposed and implemented by the University of Minnesota, the expanded role of the medical librarian includes those competencies related to instructional development and management of non-print learning resources. The role combines knowledge and skills of two professions: librarianship and teaching.

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[1] Brudvig, Glenn L. Bio-Medical Library, University of Minnesota

The library discipline provides the educator/librarian certain knowledge and skills. As an expert in the collection, maintenance, and bibliographic control of all forms of information, the librarian develops the resources needed to support education and research. As a specialist in information access and transfer, the librarian facilitates retrieval of information. Furthermore, librarianship includes communication and interpersonal relation skills, including interview technics and advisory functions. Librarianship combines the humanities emphasis on reading and reflection with the technological world of computer and machine-based operations. As a specialist, the librarian has knowledge of specific resources; but librarianship challenges the individual with the concept of world of knowledge. Librarians are sophisticated in network planning and resource sharing, often manipulating complex and confusing systems to achieve their objectives.

Scanning the literature, it becomes obvious that librarians have long been involved in educational activities. Reference activities include considerable teaching; but special courses, audiovisuals, programmed learning sequences, and lectures also are discussed in the literature. The role of educator/librarian goes beyond the more traditional teaching done by librarians. As an educator, the librarian participates in the teaching process of advising and guiding the learner. The educator role includes the formulation of learning objectives, planning the curriculum, and advising and guiding the client through the learning process. In the advisory role, the educator/librarian recommends the sources of information needed to fulfill the learning objectives. Not only does the educator/librarian assist in the curriculum design but assists the client with self-assessment of the learning experience.

The educator/librarian actively participates in the continuing education programs, the internship and clinical clerkship programs, and the inservice education offered by the institution. To do so, the knowledge and skills of both librarianship and teaching are mandatory.

To fulfill this expanded role, the individual must have a Master's degree in Library Science. In addition, a Master's degree in education or advanced course work in education is needed. This includes knowledge of educational technology, adult learning principles, evaluation, teaching technics, and management of education systems.

Combining the knowledge and skills of the librarian and the educator provides an expanded role well suited to the changes in the health care field.

Appendix 14

COST TERMS

Direct. The cost assigned or assignable to particular activities or units of output. Direct cost can be conveniently assigned or traced to a single activity.

Indirect. A cost which cannot be assigned or traced to a specific activity. Indirect costs can be allocated between activities on some convenient or arbitrary basis.

Variable. A cost which varies in direct proportion to changes in volume or level of output.

Fixed. A cost which, for a given time period and range of activity, does not vary with volume or activity level.

Overhead. Indirect

Incremental. The difference in cost between two alternatives. Also called differential or relevant data.

Out-of-pocket cost. Current or near-future outlays for the decision at hand.

NOTE: Direct or Indirect costs can include both fixed and variable components.

Example

Activity = Book Checkout

Volume		Traceability
Variable	Librarian at checkout desk	Direct[1]
Fixed*	Supervisor of checkout area	Direct
Fixed	Head Librarian	Indirect
Fixed*	Building Rent	Indirect

[1] Assume only job is checkout of books

*Fixed over some appropriate range

Reference: Charles Horngren, Cost Accounting, Prentice Hall, Third Edition, 1972.

Appendix 15

KENDALL'S COEFFICIENT OF CONCORDANCE

Kendall's Coefficient of Concordance measures how well the 31 students agree on their ranking of information search order. Each student ranked 1 through 5 the sources:

1. own books, journals, texts, personal resources,
2. preceptor,
3. local hospital library,
4. Bio-Medical Library, and
5. other health professionals

Each source received a rank from each student. If students sought information by very different patterns, student's rankings would be mixed. The preceptor could receive a mix of all ranks (1 through 5) and no pattern could ~~be discerned~~. When many students agree on the importance of the preceptor, they would give him the same or very similar ranks. Since the students rank five sources, the average rank is (1+2+3+4+5)/5=3. If ranks were assigned randomly to the preceptor (or any other category) then the average rank over all 31 students would be about 3. The coefficient of concordance measures the difference between the students' rankings of categories and the average of 3. Table XVII shows the rankings the 31 students gave to the five source categories. If ranks were very mixed for any category, the total of the ranks should be 3(31) = 93, the average rank times the number of students.

In order to calculate W, the coefficient of concordance, we find the difference between the average rank times the number of students and the actual rank total for each category. Then, square these differences and add them together; the result is called S, the sum of squared deviations. W may now be calculated by the formula.

$$W = \frac{12^{s}}{K^{2}\ (n^{3} - n)}$$

for ehich K = number of students (31) and n = number of categories (5). The coefficient of concordance, W, varies from 0, signifying complete randomness, to 1 standing for complete agreement. In our case,

$$W = \frac{12(+57^{2}+19^{2}+10^{2}+24^{2}+42^{2})}{31^{2}(5^{3} - 5)}$$

$$= 0.630$$

Our value of 0.630 is highly significant. A value of 0.630 would occur less than once in 100 samples from populations in which no agreement exists. Therefore, we conclude that our students show a high degree of agreement. The complete procedure for finding the significance level is given in Maxwell, A.E. Annalysing Qualitative Date. London: Methueu and Co. Ltd, 1961.